EAST KENT
NATURAL HISTORY SOCIETY.

A General Meeting for Scientific Purposes will be held in the Lecture Room of the Museum, on Tuesday, the 28th Inst., at Seven o'clock p.m.

The following communications are promised :==

1.—On the Arrangement of the Solid Constituents of the Ashes of Plants—by the Rev. J. B. Reade.

2.—Some Remarks on the Tick (Melophagus Communis)—by Major C. J. Cox.

3.—On the, so-called, Circulation in the Valisneria Spiralis, Auacharis, and other Aquatic Plants—by Mr. S. Harvey.

These papers will be illustrated by several Microscopes, under which various preparations will be exhibited after the papers are read.

Notice is Hereby Given that a motion will be brought forward for changing the days of meeting from Tuesday to Thursday.

JOHN S. LINFORD,
Hon. Sec.

Canterbury, Feb. 14, 1865.

P.S.===Members having Microscopes will oblige by bringing them to the room a little before the Meeting. Lamps will be provided.

P.T.O.

East Kent Nat. Hist. Society -

Meetings 1865

The meetings ~~shall~~ are to be held in Canterbury on the last Tuesdays in February and November, for the purpose of reading Papers

Two Excursions are appointed to take place yearly on the last Tuesdays in May and August for the purpose of investigating the natural objects of interest in some district in East Kent

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T. Rup. Jones
5 Cole. Terrace
Brixton

THE EAST KENT NATURAL HISTORY SOCIETY,

INAUGURATED

FEBRUARY 13TH, 1858.

LIST OF OFFICERS.
PROSPECTUS.
LAWS.

OFFICERS FOR 1858.

PRESIDENT:

SIR BROOK W. BRIDGES, Bart., M.P.

VICE-PRESIDENTS:

MATTHEW BELL, Esq.
W. OXENDEN HAMMOND, Esq.
W. CROFTON, Esq.
J. E. CROOKES, Esq.
REV. F. F. SCOTT.
MAJOR W. A. MUNN.
CAPT. C. J. COX, Q.G.
G. Y. HUNTER, Esq.
ALDERMAN J. BRENT.
G. HOFFMAN, Esq.

TREASURER:

E. F. S. READER, Esq., Sandwich.

HON. GEN. SECRETARY:

G. DOWKER, Esq., Stourmouth House, Stourmouth.

COMMITTEE:

DR. PITTOCK, Margate.
MR. J. T. HILLIER, Ramsgate.
MR. GEORGE RIGDEN, Canterbury.
MR. A. B. ANDREWS, Ditto.
MR. F. MASTERS, Ditto.
MR. J. LINFORD, Ditto.
MR. J. REID, Ditto.

LOCAL SECRETARIES AT PRESENT APPOINTED:

Isle of Thanet	Mr. J. T. HILLIER,
Sittingbourne	Dr. J. GRAYLING,
Canterbury	Mr. J. REID, (pro. tem.)
Dover	
Deal and Sandwich	
Folkestone and Hythe	
Ashford	
Faversham	

PROSPECTUS OF THE COMMITTEE.

The committee, in inviting the co-operation and support of all who reside in this division of the county, and who are interested in or have a taste for Natural History in any of its branches, beg to draw their attention to the objects for which the Society has been established.

The Natural History of every county or part of a county necessarily bears some important relation to the country at large, and the science in general; that of Kent, from its geological characters, its geographical position, with its rivers and sea-girt shore, has a high reputation in this respect. The abundance and variety of its Fauna and Flora have long been recognised. To develop and encourage a more general and practical knowledge of these features of the district is a primary object of the Society. At the same time, it proposes to cultivate and apply a more extended and enlarged acquaintance with the general principles of the science, without which the study of local details is incomplete and comparatively unsatisfactory.

The love for the study of Natural History is common to all grades of society, and its pursuit has ever had an influence for good upon its followers, the Society therefore aims to associate all classes in its roll of members. With this view a high subscription has been avoided, and it is hoped that the larger number who may thus be induced to subscribe will maintain the finances of the Society in a satisfactory and effective condition.

The objects and advantages of the Society, with the mode in which they are to be carried out, may be further briefly stated thus—

1. To associate and assemble ladies and gentlemen, whether naturalists, or merely imbued with a taste for the pursuit, irrespec-

tive of the particular branch of the study they are interested in, for the purpose of mutual information, and the promotion of the science. This will be effected by periodical meetings held in the principal Towns in rota, by local meetings amongst members in convenient neighbourhood to each other, and by occasional excursions to collect specimens and investigate objects of interest.

2. To hold out inducements to the labouring classes by free membership and rewards to study the beautiful works of Creation.

3. To circulate Journals upon Natural History.

4. To collect specimens and distribute them through the different local museums.

5. To collect and diffuse by publication correct data of every interesting fact relating to Natural History that may occur in East Kent. By these means it is hoped that those who are engaged in the agricultural pursuits for which this county is justly celebrated, will more accurately ascertain and be enabled to remove some of the causes that injure and destroy produce.

Many similar Societies are flourishing in other counties, and it is confidently trusted that the success of the EAST KENT NATURAL HISTORY SOCIETY will not be less than that of any of them. To this end it is expedient that those who desire to support the Society should make known their intentions to the Secretaries without delay.

The first of the scientific meetings for this year will be held at Canterbury, on Thursday, the 8th of April, at 2 p.m.

EAST KENT
NATURAL HISTORY SOCIETY.

TITLE AND OBJECTS OF THE SOCIETY.

The objects of the East Kent Natural History Society shall be the Collection and Diffusion of Practical and Theoretical Knowledge respecting Natural History, in all its Branches, both in relation to the particular District, and the General Science.

RULES AND REGULATIONS.

MEMBERSHIP.

1. The Society shall consist of Ordinary, Honorary, and Corresponding members, and of Associates.

2. Every candidate for admission into the Society, as an ordinary member, must be proposed in writing by two members, and the election shall be by ballot, taken at any Meeting of the Committee, or at a General Meeting—one black ball in five to exclude.

3. The Annual Subscription, to be paid by ordinary members, shall be Ten Shillings; the subscription shall become due on the 1st of January in each year, and shall be paid in advance for the current year. Any member neglecting to pay his subscription, for three months after it is due, shall be applied to by the Secretary, and if the subscription remains unpaid for three months after such application, he shall cease to be a member of the Society; but without prejudice to the right of the Society to such subscription and arrears.

4. The Committee have power to admit, without ballot, on the nomination of two members, any Lady who shall be desirous of becoming an ordinary member, and her subscription shall be Five Shillings.

5. Any persons distinguished for their researches in Natural History, for their liberality to the Society, or for their connection

with similar societies may, on the recommendation of the Committee, be elected honorary or corresponding members of this Society, provided they do not reside within the district: such honorary and corresponding members shall not be subjected to any of the expenses of the Society, and shall have no vote in its affairs.

6. In order to encourage the study of Natural History among individuals, of the class of mechanics, &c., residing in the district, the Committee shall have power to admit individuals of that class as associates, provided they shall first communicate some information or observation on Natural History, exhibit such specimens or present them to the Local Museums, as shall by their merits satisfy the Committee. Such associates shall enjoy the privilege of honorary members.

MANAGEMENT, AND BUSINESS MEETINGS.

7. The affairs of the Society shall be conducted by a Committee of Management, which shall consist of President, Vice-Presidents, Treasurer, and Honorary Secretary, and not less than six Members, who shall all be chosen at the Annual Meeting. Three Members of such Committee shall form a quorum. The Meetings shall be at least quarterly.

8. An Annual Meeting shall be held on the first Saturday in April in each year, at Canterbury, for the purpose of electing the officers for the current year, receiving the Annual Report of the Committee, and conducting the general affairs of the Society.

9. Special General Meetings may be summoned by the Committee, or by the Secretary, on the requisition (in writing) of any six Members of the Society, the specific purposes of the Meeting being stated in the notice, which shall be sent not less than one week before the time of such Meeting.

10. All questions discussed at the Meetings shall be decided by a majority of votes; and if upon any question the votes shall be equal, the Chairman of the Meeting shall have the second or casting vote.

11. In the event of any vacancy occurring in the Officers or Committee, between the Annual Meetings, the same shall be filled up by the Committee.

12. In order to facilitate the objects of the Society, the Committee shall be empowered to appoint any Member Local Secretary for the town or district he may reside in. Such Local Secretary shall be ex officio a Member of the Committee.

SCIENTIFIC MEETINGS AND EXCURSIONS.

13. To promote the interest and usefulness of the Society, four or more subscribing Members of the Society, in conjunction with a

Local Secretary, may make arrangements for organizing and holding Local Meetings, under the sanction of the Central Committee; notice to be given of such Meetings at the General Meeting.

14. Ordinary periodical meetings of the Society for the purpose of reading papers, exhibiting specimens, etc., or the discussion of subjects connected therewith, shall be held in the principal towns of the district, in rota, at such times as the Committee shall appoint; ten days notice of such meeting shall be sent to every member. Each member shall have the power of introducing a visitor to the meetings, on entering the name in a book to be kept for that purpose. Every donation of Ten Shillings, in addition to the subscription, shall entitle a member to introduce two additional visitors. Any of these ordinary periodical meetings as the committee shall appoint, may be so arranged as to comprehend an excursion or excursions for the purpose of practically investigating the objects of interest in the district, every person to bear his own expenses at these excursions.

15. A minute of the proceedings of all meetings shall be entered by the secretary in a book kept for that purpose.

PUBLICATIONS.

16. The committee shall have power, with the sanction of the author, to publish any paper or communication read before the meeting, but the author shall have liberty to reserve his right of property therein.

COLLECTION OF SPECIMENS.

17. Until the Society has a depository for that purpose, the objects of Natural History presented to the Society shall be distributed as the committee may direct, among the public Museums of the district.

CIRCULATION OF BOOKS AND FORMATION OF A LIBRARY.

18. At least one Periodical connected with Natural History shall be circulated amongst such members of the Society as desire to receive it, and after circulation shall be deposited, together with any books presented to the Society, or purchased from the surplus funds, in some place that shall be determined by the Committee under arrangements that shall make them available for reference to the members of the Society.

CANTERBURY:

PRINTED BY J. WARD, "KENTISH GAZETTE" OFFICE, HIGH-STREET.

1858.

Greenwich Natural History Club.—On Saturday, August 21st, 1858, a Field-day Meeting of this club took place at Bexley, Kent, under the guidance and upon the invitation of Mr. Flaxman Spurrell. The chief object of the meeting was to examine the extensive excavations between Crayford and Erith, from which a large number of Mammalian remains have been obtained, many of them being in the possession of Mr. Spurrell, of Bexley, and Mr. Grantham, of Crayford. Besides the members of the club, invitations were sent to some of the leading naturalists and geologists. The unfavourable state of the weather prevented a large attendance of members, and although the meeting was not numerous, still it was very pleasant and instructive. The members and friends were kindly received and hospitably entertained by Mr. Spurrell, for, after viewing the extensive series of Mammalian bones and chalk fossils, collected and preserved with taste and care, they sat down to an elegant and substantial collation. Among the members present were J. F. South, Esq., Dr. Purvis, Dr. Bossey, Messrs. W. P. Lethbridge, H. T. Stainton, W. Groves, the Rev. J. H. Knox, &c. Much interest was excited by Mr. Spurrell's collection, which contains some fine specimens of *Echinodermata* from the chalk, and a large series of fossil-remains of the elephant, horse, ox, deer, rhinoceros, cave-lion, &c., obtained from the brick-earth deposits of Crayford and Erith.

The members also visited Mr. Grantham, at Crayford, who has for many years past taken considerable interest in the same ossiferous deposits, and has formed a valuable and interesting collection. Amongst these choice specimens was a fine example of the lower jaw and teeth of the *Elephas primigenius*, which Mr. Grantham has since most liberally presented to the Hunterian Museum, at the Royal College of Surgeons.

Mr. Grantham's collection had been previously visited by Dr. Falconer, who identified remains of the following species—*Elephas antiquus*, *Rhinoceros leptorhinus*. *Equus* (a large species), *Cervus* (*Strongyloceras?*), *Bos*, and *Felis spelæa*, also *Elephas primigenius* and *Rhinoceros tichorhinus*; the two latter are considered by some to belong to a newer period than that of the other animals.

The party subsequently visited the brick-earth pits where these remains have been found.

The brick-earth or old river deposits of this locality repose on an abraded or excavated surface of the lower tertiary sands and chalk. They consist of loam, sands, and gravels. The bones above enumerated occur with a number of Testacea. Most of the species of the latter are still existing in the adjoining river; two only being found elsewhere, *Unio littoralis* of the south of Europe, and a *Cyrena*, said to be identical with a species now living in the Nile.

The interesting feature here to be noticed, namely, the occurrence of existing molluscs with remains of extinct mammals, has been already brought forward in Sir C. Lyell's works, as evidence of the comparative tenacity of existence shown by molluscan species.

Among the rarer bones are those of the great Cave Lion (*Felis Spelæa*), which must have carried devastation amongst the herds of Herbivora, some of them of gigantic proportions, that pastured in the woods and wilds of this country, then probably not dissevered from Europe.

The association of the two species of Elephant, and the two of Rhinoceros is here to be remarked, inasmuch as the *E. antiquus* and the *R. leptorhinus* are regarded as of an older date than the other species of the same genera here associated together. It is earnestly recommended, therefore, that as far as possible, in collecting the bones and teeth from these deposits, attention should be given as to the actual place of the specimens in the several layers of loam, &c., so that those occurring in the upper part should not be indiscriminately mixed with those taken from a lower position. By this means a determination may be arrived at whether there be one, two, or more distinctly marked stages in the history of the life and death of these great creatures.—*J. Morris.*

REPORT

OF

THE EAST KENT

NATURAL HISTORY SOCIETY,

WITH A LIST OF

BOOKS BELONGING TO THE LIBRARY,

&c., &c.

SESSION, 1864.

Canterbury:

PRINTED BY H. CHIVERS, PALACE STREET.

EAST KENT

NATURAL HISTORY SOCIETY.

REPORT.

The Committee in presenting their 7th Annual Report, have again to congratulate the Members on the improved position of the Society, as although their cash balance is not so large as last year, there has been a great increase in the number of members, and several valuable additions to the Library. The Treasurer has a net balance in hand of £6 18s. 4d., after paying all accounts to the end of the past year.

We have since the last annual meeting received an accession of forty-six new members, and during the same time we have lost by death and resignation 8, leaving a net gain to the Society of thirty-eight, among whom your Committee are proud to recognize several earnest workers in the different branches of Natural History.

The first meeting of the Society was held on the 23rd of February in Saint George's Hall, where a Lecture was delivered by H. W. Bates, Esq., on the River Amazons and the Natural History of the Central District of South America. The Lecture was illustrated with a large map of the course

of the river and its principal tributaries; aud Mr. Bates gave a graphic description of the luxurious forest growth that clothes the valley on each side, with a sketch of the chief animals and insects. On this occasion your Committee issued a number of free admission tickets, and the large room was well filled, more than three hundred being present; and the lecture was listened to with marked attention and pleasure throughout. The experiment of issuing a general invitation did not however produce results to induce your Committee to repeat it.

The first excursion of the year took place on the 31st of May, to Chilham and thence to Shottenden Wood. In spite of a threatening morning about 45 members and friends assembled at the Beeches at Shottenden at luncheon, and a goodly collection of Flowers and Ferns were exhibited. The President then gave a short Lecture on the formation and changes in Insects, which was interrupted by a heavy fall of rain, compelling the party to hasten their return home.

On the 28th of June the President invited the members to an extra general meeting at Fordwich House, where fifty-six members and about thirty visitors availed themselves of his kind invitation and assembled in a marquee on the lawn.

The President opened the proceedings by a short lecture on the rose—its cultivation, history, and uses, which was illustrated by some beautiful specimens of the finer or rarer varieties both cut and growing in the garden. Budding and grafting were performed by Mr. Kennett, for the instruction of the members; and the President concluded a very interesting address by briefly sketching the history of the rose farms of the east and the manufacture of otto of roses.

Mr. Dowker then explained, with the help of some clearly drawn diagrams, the principles and construction of the microscope, both simple and compound; after which, the company

adjourned to the dining-room, where were several first class instruments belonging to different members, and under which many objects of deep interest were exhibited; especially an undescribed species of Ophiura by Mr. H. Lee, Volvox Globator (alive) by Mr. G. Dowker, and the dental plates of a Starfish by the Rev. J. B. Reade.

The next meeting of the Society was the autumn excursion to the neighbourhood of Folkestone on the 30th of August, on which occasion a Committee was formed at Folkestone to receive and welcome the Society. About 50 members assembled at Copt Point at 2 p.m. on that day, and after exploring the Flora of the immediate neighbourhood, descended to the beach, where W. Whitaker, Esq., B.A., F.G.S., gave a short lecture on the secondary strata, which are well shown at that spot. By the help of a large diagram he pointed out in the surrounding cliffs almost the entire cretaceous group, from upper chalk through lower chalk, upper greensand (not visible in consequence of the fall of the cliff) and gault to lower greensand. Several fossils from the gault were collected, and many actiniæ and marine Polyzoa from the rocks on the shore, and the party returned over the cliff to the Pavilion Hotel, where they dined together—the President taking the chair, and supported by two of the Vice-Presidents, Capt. Crookes and Dr. Boycott. After dinner 13 new members were proposed and elected at the next committee meeting.

The President having received an invitation for the Society, from a Committee of gentlemen at Dover, to attend a Microscopic Meeting in the Maison Dieu at that place, and your Committee having accepted the same on behalf of the members, a meeting was accordingly held there on the 3rd of November, which was very numerously attended, both by the members of the Society and by the citizens of Dover. The members assembled in the Museum at Dover, where they were addressed by Dr. Astley the Curator, after which they adjourned to the

Maison Dieu, where the President delivered an address on the objects and uses of the Society, which he has since published and circulated among the members. Thirty-two microscopes of various sizes and descriptions were exhibited on a long and wide table in the centre of the Hall, among which were some first class Binoculars by T. Ross, some cheaper Binoculars by C. Baker, single tube instruments by both those makers and by Smith and Beck, Pillisher, Highley, Powell and Leland, &c. The objects of interest shewn by these were too numerous to particularize; consisting of rive and mounted Zoophytes, Diatomaceæ, Xanthidiæ, Insects and parts of Insects, Sections, Algæ, &c., &c. The meeting was admirably organized by the Dover Committee, and was a decided success; and with the Folkestone meeting has contributed greatly to increase the number of members of the Society.

The last meeting of the year was held in St. George's Hall, when a Lecture was delivered by B. F. Lowne, Esq., on the Natural History of Palestine and the Bible. Mr. Lowne had travelled in Palestine with the expedition organized by the Rev. Mr. Tristram as Surgeon and Naturalist, and gave a graphic description of the Geological Features of the Jordan Valley, the Lebanon Range and the Dead Sea; showing the effect of the formation of the Country on its natural products, and the relation of its Flora and Fauna to those of Europe on the west, and Africa and Asia on the south and east.

On this occasion, your Committee thinking the citizens of Canterbury might be interested in the subject of the lecture, resolved to admit non-members on a small payment, but the invitation was not responded to, and the lecture (which gave great satisfaction to those who heard it) was listened to by an audience more select than numerous.

The Monthly Evening Meetings, which were commenced

in 1863, have been continued regularly through the past year, and with one or two exceptions have been well attended, and many objects of interest exhibited and discussed, (especially some very interesting specimens of Marine Polyzoa and Annelilida, by Mr. Saunders); and your Committee believing much benefit has accrued from these meetings, and much information been gained and disseminated at them, recommend their continuance in the present year.

The Prize offered by the President at the last Annual Meeting has not been awarded, as there was but one competitor; and our want of room has assisted in preventing the institution of the courses of elementary lectures hoped for in our last report.

Annexed is the Treasurer's statement of account for the past year, and a list of the books in the Library, those added during the year being marked with an asterisk.

Your Committee have to regret the loss of the services of Dr. Boycott one of your Vice-Presidents.

It having been suggested to the Committee that an exhibition of Roses would be very popular in Canterbury, your Committee, having carefully considered the matter, and ascertained that they are likely to be well supported by the nobility and gentry of the county, beg to recommend that an exhibition of the native and cultivated varieties of the Rose be held at Canterbury, under the auspices of the Society, about Thursday June the 22nd; and in order to induce exhibitors to send specimens, prizes be offered for competition, under such regulations as a Committee specially appointed shall determine on, and a subscription be started to defray the cost thereof.

In concluding their report the Committee can but congratulate the members on the success that has attended the

meetings during the year, and the improved position of the Society generally; and again urging on members the utility and necessity of each member noting carefully the observations that fall in his way of the Natural History of his own immediate neighbourhood, or of any part of the county where he may be sojourning, as it is by a number of separate observations, apparently trivial in themselves, that many of the great truths of the science have been established. With our increased number of members, spread over a space comprehending Dover, Deal, Sandwich, Ramsgate, Margate, Herne Bay, Whitstable, Faversham, Sittingbourne, Tenterden, Ashford, Hythe, and Folkestone, we should be in a position to make out a complete Fauna and Flora for East Kent, particularly of the neighbourhood of the coast line—a task the Committee hope for the cordial co-operation of the members in attempting.

FINANCIAL STATEMENT.

RECEIPTS.	£	s.	d.
Balance in hand Dec. 31st, 1863	14	10	4
Subscriptions for 1863	0	10	0
Ditto for 1864	29	6	0
	£44	6	4

EXPENSES.		£	s.	d.
W. W. Bates, Esq., Lecturer		3	3	0
Mr. Ginder for hire of room		1	11	6
Contribution to the Library		10	0	0
Donation to the Library fund		1	5	0
B. J. Lowne, Esq., Lecturer		3	0	0
Mr. Ginder for hire of room		1	1	0
Rent, 1 year, due January 6th		10	0	0
Fire and candles		1	0	0
Secretary for sundry expenses		2	7	0
Treasurer for stamps and paper		0	5	0
Mr. Chivers for printing		3	15	6
		37	8	0
Balance in Treasurer's hands	£6 0 6			
Ditto in Secretary's hands	0 17 10			
		6	18	4
		£44	6	4

GEORGE RIGDEN, Hon: Treasurer.

January, 1865.

LIST OF BOOKS AND PERIODICALS.

Belonging to the East Kent Natural History Society.

1. British Land and Fresh Water Mollusks, 1 vol., (Reeve)
2. Bryologia Britannica, 1 vol., (Wilson)
3. Synopsis of British Sea Weeds, 1 vol., (Harvey)
4. Flora of Surrey, 1 vol., (J. A. Brewer)
5. Manual of Geology, 1 vol., (Professor Phillips)
6. Flora of East Kent

*7. Morris's British Butterflies, 1 vol.
*8. Ramsays Physical Geography of Great Britain, 1 vol.
*9. Dallas' Animal Kingdom, 1 vol.
*10. Johnstone's British Zoophytes, 2 vols.
*11. A Catalogue of rare Phœnogamous Plants collected in South Kent in 1829.
*12. Memoirs of the Geological Survey of Great Britain.

PERIODICALS.

Natural History Review, vol 3, 1863. (Half bound Calf)
The Zoologist, from 1843 to 1852. (In Cloth)
,, 1853 to 1855. (Half bound Calf)
,, 1856 to 1857. (In Cloth)
,, 1858 to 1861, and for 1863. (Half bound Calf)
N.B.—The Zoologist for 1862 is incomplete at present.
The Quarterly Journal of Microscopical Science, vols. 7 and 8, old Series. Vols. 1, 1861, and 3, 1863, new ditto. Half bound Calf)
Magazine of Natural History, vols. 3, 4, 5, 6, 7, 8, 11, and 12, 3rd Series. (Half bound Calf)
The Geologist, vols. 2, 3, 4, and 6. (Half bound Calf)
The Phytologist, vol. 3, 1859. (Half bound Calf)
Hand Book of British Flora, parts 1, to 24.
British Moths, Nocturni.
,, Geometræ.
Proceedings of the Geologist's Association, 1863-4.

N.B.—As it is most important to increase the number of Books in the Library for the use of Members, a special subscription for the purchase of Books, or donation of works on Natural History will be thankfully received by the Committee.

THE FOLLOWING PERIODICALS

ARE TAKEN IN BY THE SOCIETY, VIZ:

1. Natural History Review
2. The Annals and Magazine of Natural History
3. Quarterly Journal of Microscopical Science
4. The Zoologist
5. The Geological Magazine
6. Hand Book of British Flora
7. Quarterly Journal of the Geological Society
8. „ „ Science.

LIST OF BOOKS, &c.

LENT TO THE EAST KENT NATURAL HISTORY SOCIETY'S LIBRARY.

1. The Ray Society's Publications from 1845 to 1854, 12 vols. By James Reid, Esq.
2. Balfour's Class Book of Botany, 1855 and 1859, 2 vols. By James Reid, Esq.
3. Geology of South East of England, 1833, 1 vol. By James Reid, Esq.
4. Clark's British Marine Testaceous Mollusca, 1855, 1 vol. By G. Dowker, Esq.
5. Martin's Geological Memoir of Part of Western Sussex, 1828, 1vol. By James Reid, Esq.
6. Mantell's Geology of Surrey, 1840, 1 vol. By James Reid, Esq.
7. Buckland's Reliquiæ Diluvianæ, 1823, 1 vol. By James Reid, Esq.
8. Work on Butterflies, 1 vol. By Rev. F. Rouch.
9. Hints on the formation of Local Museums. By James Reid, Esq.
10. Letters of Rusticus on the Natural History of Godalming. By Miss Kenrick.

LIST OF OFFICERS AND MEMBERS.

President:

SIR WALTER JAMES, BART., Betshanger.

Vice-Presidents:

THE VERY REV. THE DEAN OF CANTERBURY.
SIR BROOK BRIDGES, BART., M.P., Goodnestone Park.
MAJOR C. J. COX, Fordwich House.
MATTHEW BELL, Esq., Bourne Park.
WM. OXENDEN HAMMOND, Esq., St. Albans.
REV. J. P. SCOTT, Sibertswould.
CAPT. CROOKES, Dover.
REV. J. MITCHINSON, King's School.
REV. J. B. READE, Bishopsbourne.

Treasurer:

G. RIGDEN, Esq., Burgate Street.

Secretary:

MR. JOHN S. LINFORD, Burgate Street.

Committee:

J. BRENT, Jun., Esq.
G. FURLEY, Esq.
COLONEL HORSLEY.
MR. S. HARVEY.
CAPTAIN KEMP.
MR. W. MOUNT.
H. B. MAKESON, Esq.
F. H. SANKEY, Esq.
REV. F. ROUCH.
MR. S. SAUNDERS,
Dr. TASSELL.

Local Secretaries:

G. BOTTLE, Esq., Dover.
Dr. FITZGERALD, Folkestone.

MEMBERS.

Alford, Very Rev. Dr.	Dean of Canterbury
Andrews, A. B. Esq.	Westgate, Canterbury.
Alcock, Rev. J. P.	Ashford.
Austin. Rev.	St. George's.
Abram, Mr, W.	St. Dunstan's
Bridges, Sir B. W., Bt., .MP.	Goodnestone Park.
Bell, M. Esq.	Bourne Park.
Bottle, Mr. A.	Dover.
Bateman, Mr. J.	St. George's Street, Canterbury.
Bland, W., Esq.	Hartlip, Sittingbourne.
Brent, J. jun., Esq.	Dane John.
Briggs, Rev. J. B.	Folkestone.
Briggs, A. Esq.	Tenterden.
Brooke, John Esq.	Folkestone.
Bowles, Robt. Esq.	Ditto.
Barrow, Mrs.	Walmer.
Browne. Miss L.	4, Victoria Terrace, Canterbury.
Crookes, Capt.	Dover.
Cotton, H., Esq.	Dent de Lion, Margate.
Cox, Major	Fordwich House.
Cox, Mrs. C. J.	Ditto
Chivers, Mr.	Palace Street.
Chaffey, Mrs.	Doddington near Faversham.
Dowker, G., Esq.	Stourmouth House.
Dowker, Mrs.	Ditto.
Drew, C. T., Esq.	Chartham.
Doridant, C., Esq.	Folkestone.
Davidson, — Esq.	Littlebourne.
Ellis, W., Esq.	Folkestone.
Eastes, S., Esq.	Ditto.
Ellis, Rev. J. H.	Elham.
Farren, Col., C. B.	Colchester.
Furley, R., Esq.	Ashford.
Furley, Geerge, Esq.	Barton Villas, Canterbury.
Forrest, Mrs.	Orchard Place, Canterbury.
Fitzgerald, Dr. W.	Folkestone.
Grayling, J., Esq,. M.D.	Sittingbourne.

Green, Mrs. J.	Canterbury.
Greaves, Mr. Cyril	Ditto.
Gillett, Mr.	Ditto.
Hammond, W. O., Esq.	St. Albans.
Hallowes, Mrs. P. B.	Stour Street, Canterbury.
Hoare, W. P., Esq.	Faversham.
Hatfield, G. T., Esq.	Word near Sandwich.
Hatfield, Mrs.	Ditto.
Hatfield, Miss	Ditto.
Harvey, Mr. S.	High Street, Canterbury.
Horsley, Col.	St. Stephen's Lodge.
Hart, R. Esq.	Folkestone.
Imthurn, Miss	Wincheap.
James, Sir W., Bart.	Betshanger.
Jenner, Rev. H. L.	Preston Vicarage.
Kersey, Dr.	Littlebourne.
Kersey, Mrs.	Ditto.
Kenrick, Miss	Stone House, Canterbury.
Kemp, Capt.	Cavalry Barracks.
Kingsford, Miss	Seaton.
Lake, Robt., Esq.	Milton Chapel.
Leith, R. M., Esq.,	Folkestone.
Lee, R., Esq.	The Waldrens, Croydon.
Levy, Adolphus, Esq.	Folkestone.
Linford, Mr. J. S.	Canterbury.
Linford, Mrs.	Ditto.
Makeson, H. B., Esq.	High Street, Hythe.
Mitchinson, Rev. Dr.	King's School.
Mount, Mr. W.	Canterbury.
Neame, Mrs. A.	King's Bridge, Canterbury.
Neame, Miss C.	Orchard Place, Canterbury.
Neame, E., Esq.	Selling.
Neame, Mrs.	Ditto.
Pittock, G. M., Esq., M.D.,	Margate.
Parker, R. D., Esq.	Barham.
Pool, Mr.	High Street, Canterbury.
Powell, Rev. W.	Folkestone.
Powell, Mrs.	Canterbury.
Reid, Jas., Esq.	Bridge Street, Canterbury.
Rigden, G. Esq.	Burgate Street.
Rouch, Rev. F.	Precincts, Canterbury.
Reade, Rev. J. B.	Bishopsbourne.
Reade, Geo., Esq.	Ditto.
Scott, Rev. L. F.	Sibertswould.
Sankey, Robt., Esq.	Castle Street, Canterbury.
Sankey, F. H., Esq.	Wingham.

Sankey, Mrs.	Wingham.
Saunders, Mr. Sibert,	Whitstable.
Slater, F., Esq.	Chislett.
Scudamore, Dr.	Harbledown.
Smith, Capt. Carleton	Dover.
Stock, Henry, Esq.	Folkestone.
Sankey, Herbt. T., Esq.	Burgate Street, Canterbury.
Tainch, E. C., Esq.	4, Spencer Square, Ramsgate.
Tucker, Mr. E.	The Grove, Margate.
Thurston, Thos., Esq.	Ashford.
Tassell, Dr.	St. Margaret's Street, Canterbury.
Tylden, Rev. M.	Stamford Rectory, Hythe.
Taylor, Mrs. A.	North Street, Herne Bay.
Thornton, W. H., Esq.	Hawley Square, Margate
Tyson, W. T., Esq.	Folkestone.
West, Rev. J. F.	Birchington, Thanet.
Walker, Mrs.	St. George's Place, Canterbury.
Ward, Miss	High Street, Canterbury.
Whittaker, W., Esq.	St. Margaret's, Canterbury.
Wilson, J. L., Esq.	Bridge Street.
Worsfold, Christopher, Esq.	Dover.

The following were elected at the Annual Meeting:—

Green, Mrs. A.	9, Clarence Lawn, Dover.
Hambrook, Mr. J. B.	Strond Street, ditto.
Kingsford, — Esq.	Lundy House, ditto.
Lewis, F., Esq.	Castle Street, ditto.
Lindsay, J. B., Esq.	Maison Dieu Road, ditto.
Mummery, Mr. W. P.	Strond Street, ditto.
Pryer, E. J., Esq.	ditto. ditto.
Spice, C., Esq.	ditto. ditto.
Weston, L., Esq.	Waterloo Crescent, ditto.
Wightwick, W., Esq.	Folkestone.

CHIVERS, PRINTER, PALACE STREET, CANTERBURY.

FOURTEENTH REPORT

1871

OF THE

EAST KENT NATURAL HISTORY SOCIETY,

ADOPTED AT THE

ANNUAL MEETING,

HELD ON FEBRUARY 27th, 1872.

CANTERBURY:

PRINTED AT THE "KENTISH GAZETTE" OFFICE, HIGH-STREET.

MIDDLE SCHOOLS,
CANTERBURY.

March. 12. 1887.

Dear Sir.

At the last meeting of the Committee of the East Kent Socy. it was resolved that Copies of our Reports should be sent to the British Museum Library (Nat. Histy) in response to your request of the 21st. Feb. 1887. I am, however, sorry to say that we have not an unbroken series to complete your Numbers.

By parcel post I am sending you Copies of the. 14th. 15th. 16th. 17th. 18th. - - - 22nd. - - . 24th. 25th. 26th. 27th. 28th. 29th. and also a copy of No. 1 of the new Series of Transactions. - Yours faithfully

William P. Mann.
Hon. Secretary.

FOURTEENTH REPORT

OF THE

EAST KENT NATURAL HISTORY SOCIETY,

ADOPTED AT THE

ANNUAL MEETING,

HELD ON FEBRUARY 27th, 1872,

WITH

A List of Books belonging to the Library,

&c., &c.

SESSION, 1871.

CANTERBURY:

PRINTED AT THE "KENTISH GAZETTE" OFFICE, HIGH-STREET.

CONTENTS.

East Kent Natural History Society.

ABSTRACT OF THE PRESIDENT'S ADDRESS.

The President, previous to vacating the chair, delivered an Address on the value of Natural History Societies educationally considered. He observed that science had now definitely asserted its claim to be recognized as an integral branch of a liberal education; this was not an unmixed good, for quite independently of the natural clinging to time-honoured and well-tried systems of mental training, there was a real danger of losing in depth what was gained in comprehensiveness, and, considering the wide field of the natural sciences, this was a real danger. Still, in the face of the wonderful progress of discovery in the domains of nature and in its application to man's life and comfort, and of the manifest current of thought which was setting in that channel, it would be simply impossible, whatever might be done with the present, that the rising generation of whatever class should not receive sufficient elementary instruction in the principles of science to enable them to pursue in one or other of its branches as they grew up. Much caution, however, would have to be used in the method of science-teaching. It might take two forms: one, the more attractive one, of trying to impart some knowledge of all the leading sciences; the other, the sounder one, of selecting a very limited number, and those the severer ones, and endeavouring to teach the principles of these thoroughly, leaving their after development to individual self-culture. Now if all this were granted, it followed that all who professed to interest themselves in education, whether of the higher or lower classes, must, from the nature of the case, interest themselves in whatever tended to advance or teach science; and hence he took occasion to express surprise and regret that so many of the upper, the professional, and the middle class in Canterbury should hold aloof from a Society which, whatever its past shortcomings, was struggling into a groove of good and useful work. He concluded by raising the question whether the Society might not do something in Canterbury to solve the question how is science-teaching to be brought within the reach of the young persons of the upper and middle class in Canterbury.

Report of the Committee.

During the year 1871 the financial state and the number of members have been satisfactorily maintained. At the end of the year 1870 a balance of 11s. 4d. remained in the hands of the Treasurer, and the members numbered 75; at the close of the year 1871 that balance was £7 19s. 6d., and the number of members 81. Four new members have already joined the Society and paid their subscriptions for the year 1872; and it is hoped that all those persons in the district who undertake to conduct or patronise the present movement for education will sooner or later recognise the usefulness of the Society in this respect. Of past years there is the large sum of about £19 still due to the Treasurer for subscriptions.

In the last Report the Committee congratulated the Society on the increased value of the Library, and have now the pleasure to announce that this value has been enhanced during the year just passed. Hence such a collection of books on Natural Science is placed at the service of the members as to offer an important and even essential aid in a district where no other public Library of the same kind exists; and, though the Library consists mainly of such standard books of reference as may be deemed permanently valuable as property or capital, periodical publications in sufficient number to afford the members an ample knowledge of the progress of the different branches of natural science have been and still are provided. Hence the use of the Library and apartment would be a more liberal return for the annual subscription than could be elsewhere obtained; and, as a provision for the advancement of education, should command the support of the intelligent community of the city and neighbourhood. And of such support the Society will appear still further deserving, when we consider the several advantages of its regular and frequent meetings and excursions, by means of which the members enjoy the most favourable opportunities of providing for or sharing their wants and acquisitions, in a manner too that cannot fail to promote the knowledge of natural science in the district.

Thus the Library, though a paramount object, is not the only means employed by the Society for the promotion of a practical and theoretical knowledge of Natural History. Distant excursions, when judiciously conducted, could not fail to be useful in this respect; but these have proved so difficult to accomplish, and so little encouraging, that only one was undertaken in 1871, and a single one in 1870. Accordingly your Committee turned attention to the excursions, already mentioned, nearer home, and instituted fortnightly meetings for the transaction of the scientific business of the Society, including the examination of the results of those excursions in the neighbourhood. And thus this frequent and easy intercommunion of the members and their friends has proved, as was predicted in the last Report, eminently successful, and the Society has accordingly presented such an increased activity and usefulness as must be gratifying to the members. But much remains to be done by the Society. It has yet to awaken an interest in and a zeal for the subject; and this can only be done by promoting a knowledge of it, especially in a district where the taste

has to be created, and has so long been suppressed by the deplorable state of the City Museum, concerning which your Committee had to express regret in their last Report. To superficial observers, the natural history of a small district might appear very limited; but it is really so very extensive as to require the co-operation of many good naturalists for its successful cultivation, and even then would be neither exhausted nor completed. And, as already intimated, the City Museum has of late years contributed little, while it might have done much, towards this desirable end. But this has at least been promoted by the frequent Lectures, Discourses, Demonstrations, and Exhibitions at the Evening Meetings of your Society. Besides, during the past year it has done something more in contributions to the general stock of natural science, as may be seen by the short abstract, in pages 9 to 16 of the present Report, of such portions of the Society's Proceedings as appeared in the "Quarterly Journal of Microscopical Science" for January, 1872.

Still that abstract, being necessarily confined chiefly to microscopical work, takes so little notice of larger labours that it remains to mention them. At the meetings were given Lectures and other forms of contribution admirably suited to cultivate a taste for Natural History. For these services the cordial thanks of the Society are especially due to Dr. Mitchinson, Colonel Horsley, Colonel Cox, Major Munn, Mr. Sibert Saunders, Mr. Dowker, Mr. Gulliver, and Mr. George Gulliver. The same thanks were well earned too by Colonel Horsley, Colonel Cox, Mr. Sidney Harvey, Mr. Sibert Saunders, Mr. Bell, Mr. Fullagar, and Mr. Down, for the valuable illustrations afforded by their microscopes; and to Mr. Fullagar for the frequent exhibitions of living specimens of the lower animals kept in his aquarium, concerning many of which he often communicated interesting drawings and practical observations to the Society. The exhibition by Colonel Cox of his collection of Beach Pebbles, in connection with his excellent Lecture thereon, proved very interesting and instructive at one or two of the evening meetings; nor was Mr. Dowker's Lecture in the field, at the Dover excursion, less valuable, happily using as he did on the occasion nature's own diagrams, as they still stand, in illustration of the geology of that district. Indeed, your Committee have no hesitation in expressing the conviction that the gratuitous services of the members of the Society have been far more useful than any that it could have obtained from paid lecturers.

As to the publication of such Proceedings, they have been regularly reported, so much to the credit of our local press, in the *Kentish Gazette*, as to meet with the warm commendation of many members of the Society, and to find a place in several of the London journals. But such matters, though highly valuable to the members present at the Meetings, to many necessarily absent, and to a large number of other persons interested in local news, were not intended for separate publication by the Society; and, indeed, from the great extent of the papers, such publication would be out of the question, and they are accordingly preserved for reference in the Minutes of the Meetings. There is, however, one address, that on the Objects and Management of Museums, which has an application so general and particular, and which has been so frequently applied for, that

your Committee have decided on inserting it in the Report, as the most convenient way of answering such applications; and this the more willingly, as it seems creditable for the Society to take a lead in the reform of Museums which, though supported by the local rates, have not yet been made fairly subservient, as they ought and were intended to be, to the interests of education.

In the course of their labours to promote the activity and usefulness of the Society, your Committee have found some of the Rules which, strictly interpreted, obstruct or interfere with the business. The proposed alterations are chiefly of a mere formal character, and are recommended, after much consideration, to be adopted, as they will much facilitate the business, especially in giving precision to the times of the meetings, whether Scientific, General, or of Committees. Thus it is hoped to solve the questions, hitherto so perpetually recurring, on these matters plainly for every member who may look at the standing Rules, and to obviate the necessity of the issues of such special notices of information as the members may reasonably require to possess already in those Rules, concerning all the ordinary meetings and other business of the Society. And, for the further convenience of the members, it is proposed to notice distinctly on a fly-leaf of the Report all the fixed meetings, so that it may be torn out and stuck up as a remembrancer.

Finally, your Committee, recognising the expediency of co-operation with other and kindred Societies, have agreed to mutual visiting privileges as to meetings and excursions, and to the interchange of Annual Reports, with the Croydon Microscopical Club, and the Eastbourne Natural History Society; and will be happy to consider the question of extending the arrangement, whenever desired, to other Societies.

Sub-Committee on the Flora of East Kent.

The work of this Committee has been unfortunately suspended during the past year owing to the causes mentioned in the last Report. The analysis and registry of the returns made by members during 1870 have proved too much for the time at the disposal of the Secretary of this Committee. Indeed, the Secretary found it necessary to resign office last July, promising to complete the register as soon as he could. The plan adopted is one that may easily be resumed, it only requires some one with a little spare time and a knowledge of Botany, to volunteer to carry it out. A balance of 4s. 8d. remains to the Committee from the grant made in 1870.

Report of the Librarian for the year 1871.

The funds at the disposal of the Librarian during the year 1871, consisted of £1 15s. 8d., being the balance remaining from 1870, and £10 from the general funds of the Society, making a total of £11 15s. 8d. Of this sum £3 11s. 5d. was spent in the purchase of new works, as mentioned below, £6 0s. 10d. for periodicals, and 17s. 11d. for binding eight volumes of the previous year's periodicals, leaving a balance in hand of £1 5s. 6d.

The new works above referred to are—

1. Westwood's Modern Classification of Insects, 2 Vols., 8vo.
2. Rymer Jones' Outlines of Organization of Animal Kingdom, 1 Vol.
3. Quekett's Lectures on Histology, &c., 2 Vols.

The periodicals taken in by the Society are the same as in 1870.

In return for the one guinea annual subscription to the Ray Society the following work has been received, viz.—

A Monograph of the Gymnoblastic or Tubularian Hydroids, folio, by G. J. Allmann, M.D.

The undermentioned pamphlets were presented to the Society, viz.—

Crustacea Amphipoda Borealia et Arctica, by Axel Boeck.

Phanerogamer og Bregner, by A. Blytt (from the Royal University of Norway).

Third Annual Report of the Folkestone Natural History Society for 1871.

First Report of the Proceedings of the Croydon Microscopical Club for 1871.

Third Annual Report of the Eastbourne Natural History Society for 1871.

FINANCIAL STATEMENT, 1871.

RECEIPTS.

	£	s.	d.
Balance in hand, 31st December, 1870	0	11	4
Subscriptions received in 1871, including Dover Branch to this date for 1871	35	15	6
	£36	6	10

Examined and found correct, January 26, 1872.
GEORGE RIGDEN.

Canterbury, 26th January, 1872.

EXPENSES.

	£	s.	d.
Rent of Room in Precincts for 3 Quarters	7	10	0
Fire and Candles in ditto for ditto	0	15	0
Rent of Room in High Street for 1 Quarter	2	10	0
Fire in ditto for ditto	0	5	0
Mrs. Ward, for Printing	4	2	6
Contribution to Library	10	0	0
Subscription to Ray Society	1	1	0
Bateman, for Painting Name of Society at New Premises	0	14	0
Hobday, for Moving Cases, Books, &c., and making Stand for Book Shelf	0	8	0
Petty Cash to Hon. Assistant Secretary	1	0	0
Postage by Treasurer	0	1	10
Balance in hand 31st December, 1871	7	19	6
	36	6	10

W. H. HORSLEY, Colonel,
Honorary Treasurer.

East Kent Natural History Society.

President, the Rev. John Mitchinson, D.C.L., &c., Oxon.; Honorary Secretary, George Gulliver, Esq., F.R.S.

As its name imports, this Society is by no means confined to microscopical work. But the name of the Honorary Secretary will afford sufficient guarantee that both animal and vegetable histology are well prosecuted; and of these departments we propose to give reports. Indeed, the Society presents a remarkable sphere of usefulness in the application of the microscope to natural science, as at the scientific meetings, which are held fortnightly at Canterbury, it is the usual course to make the dissections of animals and plants, and the microscopic demonstrations thereof, in the presence of the members.

December 7th, 1870.—Living specimens of *Trichodina* and *Vorticellina* were exhibited by Mr. Fullagar; when the longitudinal central muscle of *Vorticella* was well shown by Mr. Sidney Harvey. Mr. Gulliver gave practical demonstrations of the microscopic structure of the so-called scales of *Anguis fragilis*, proving that the dermal scales of this reptile are true bone and not horny epidermis; an important fact, as another evidence of the lacertian affinities of this creature, since in true Ophidians the scales are horny epidermis, and not bone.

January 11th, 1871.—The branchiæ and the circulation of the blood were examined in some Entomostraca, and an explanation of the difference between gills and lungs was given, both in vertebrates and invertebrates, and of the special function in relation to respiration of the red blood-corpuscles of vertebrates.

January 25th.—Colonel Horsley gave some demonstrations of plant-crystals—Raphides, Sphæraphides, and Crystal Prisms; whereupon Mr. Gulliver showed the very great importance of such crystals, especially rhaphides, in taxonomy. Thus, for example, in the British Flora, the shortest and sharpest diagnosis of the order Onagraceæ would be Calycifloral Exogens abounding in raphides; of Galiaceæ, Corollifloral Exogens abounding in raphides; of Orchidaceæ, Gynandrous Endogens abounding in raphides; of Hydrocharidaceæ, Hydral Endogens destitute of raphides. And similar exemplifications might be multiplied extensively, as may be seen in Mr. Gulliver's various memoirs in the 'Popular Science Review,' Oct., 1865; 'Ann. Nat. Hist.,' 1861-65; 'Quart. Journ. Mic. Sci.,' 1864, 1865, 1866, and 1869 and 'Seeman's Journ. Bot.,' 1864, 1866, 1867, and 1869. The raphidian character was represented as so eminently natural, so easy to realise, and often so much more universal and fundamental than other single diagnostics, as to make it surprising that systematists, still exclusively using the old diffuse and often difficult characters, should not yet have taken advantage of it.

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February 8*th.*—Mr. Harvey displayed some Rotifers; and Mr. Fullagar some young of *Paludina vivipara*, bred in his aquarium. Miss Croasdill sent some specimens of Velella collected at Tenby, and a discourse was given on the structure and economy of the class of Acalephes.

February 22*nd.*—Mr. Fullagar exhibited the Crystal Prisms of Quillaia bark, showing their large size, and how, in their shafts and tips being prismatic or angular, they differ from Raphides. These last have rounded shafts, and occur loosely together in bundles, and may thus be easily known from crystal prisms; which prisms proved to be excellent for experiments with polarised light, while true raphides are not so. It was observed that the order Iridaceæ abounds in crystal prisms; and that the well-known *Iris Germanica*, so common in our cottage gardens, is a good plant, always at hand, in which to examine them.

March 8*th.*—Col. Horsley and Mr. Bell displayed some Diatoms; and Mr. Down some of the Canterbury mosses, with dissections of the sporangium and peristome of *Hypnum confertum*. Mr. Fullagar showed several specimens of freshwater Polyps, some of which were bred in his aquarium, as he believed, from eggs deposited there by the parents during the preceding autumn.

March 22*nd.*—Col. Horsley gave demonstrations, from preparations made extemporaneously, of the characters of the Crystal Prisms of Guaiacum, and of the Sphæraphides of the prickly pear (*Opuntia*); whereupon the Hon. Sec. observed that these prisms are good tests of the genuineness of the officinal barks of Quillaia and Guaiacum, and that though the crystal prisms are abundant in many British Endogens, and in various exotic Exogens, including trees and shrubs, these crystals had not yet been found in our native Dicotyledons. And, indeed, while in foreign exogenous trees and shrubs true Raphides are not uncommon, they have not at present been demonstrated in any British trees.

April 13*th.*—Mr. Bell, Mr. Fullagar, and Mr. Down, displayed some lively specimens of *Volvox* and *Closterium*, and some very fine ones of *Sphærosira*. The circulation of the sap, and the multiplication by binary subdivision, were well shown in *Closterium lunula*.

April 27*th.*—The Rev. C. W. Bewsher exhibited a fine specimen, bigger than a bucket, of 'Neptune's Cup,' like that originally described by Hardwick, in the 'Trans. Lin. Soc.,' as a Sponge allied to Cliona. The present example came from the Mauritius. The character of its siliceous spicules was shown under various microscopic powers. *Hydra viridis* and *H. fusca*, now very abundant about Canterbury, were shown by Mr. Fullagar and Mr. Bell, when the process of multiplication by budding was well seen.

May 11*th.*—Mr. Gulliver exhibited specimens of Planer's Lamprey, now very abundant in the Stour River, at Canterbury, and gave demonstrations of several points of the anatomy, not yet recognised in the systematic books, concerning the Petromy-

zonini :—1st. *The red Corpuscles of the Blood*, though circular, agree in structure with the same corpuscles of all other Pyrenæmata. 2nd. Though usually described as "Dermopteri without *Fin-rays*," these rays, composed of cartilage-cells, were plainly shown in the fins of these fishes. 3rd. The *Lens-fibres* are smooth, being destitute of the indentations and interlocking of the edges, so characteristic of most fishes. 4th. The male has at this season a distinct *Penis*, and the females a similar but broader and shorter process. The organ in both sexes has a single central and longitudinal canal, through which the generative and urinary products pass; and it is probable that there is a true copulation. 5th. *Platyelminthes* in the brain in every one of the Lampreys that were examined, and these Entozoa so abundant as to fill the space between the skull and brain, and often pressing into the cerebral substance, but not found in or about the nerves elsewhere. These new worms may be called, provisionally, *Neuronaia Lampetræ*, as being allied to, though very different from, *N. Monroii*, described by Goodsir, in the nerves of the cod-fish family. Many of these facts are detailed and figured in the 'Proc. Zool. Soc,.' December 6th, 1870.

May 25th.—No microscopic business, the meeting being occupied with Mr. Fullagar's description of the metamorphoses of Libellula, and by Mr. James Reid's observations on the labellum in *Orchis fusca* and the allied species.

June 8th.—Mr. Fullagar and Mr. Harvey showed the vibratile cilia on the surface of the gills of a larval Triton. Mr. Gulliver exhibited what he described as the Intestinal Respiration in a worm of the Naid family. This creature, common in the pools about Canterbury, is colorless, about a quarter of an inch in length, very thin, with flat segments, mostly having long and slender lateral hairs, and the body so pellucid as to admit of admirable views of the phenomenon. The vivid action of the vibratile cilia within the intestine, and the rapid and incessant current of the water over the cilia, afforded a most remarkable spectacle, and left little doubt that this is a true respiration, heretofore so obscure, in the abranchiate worms. Mr. Gulliver added that the action may be seen in *Sænuris variegata*.

June 22nd.—The manner of feeding, and the structure of the nettle-cells and threads of the *Hydra* polyps were exhibited by Mr. Fullagar and Mr. Harvey; and Mr. Bell displayed the structure of the Spiracles and Tracheæ of insects. Extemporaneous preparations were made and examined, of the peculiar leaf-cells of Sphagnum; and in like manner the Osseous Granules were shown in an insectivorous mammal, and in the boiled bones of the codfish.

July 5th.—The members of the Society were hospitably entertained by Colonel Horsley, at his residence, St. Stephen's Lodge. The anatomy of a fresh female specimen of *Gordius* was explained. Mr. Fullagar presented beautiful examples of the Stigmata, and their perforated plates, of *Ixodes ricinus*. Mr.

Gulliver gave a lecture "On British Reptiles and Batrachians, with a comparison of the red corpuscles of their blood with those of certain exotic species." Though the characters afforded by the blood-disks have not yet found their place in systematic zoology, they are so important that they must soon be regularly recognised. He showed specimens of these corpuscles from all our indigenous Reptiles and Batrachians, and from the foreign *Siren*, *Proteus*, *Amphiuma*, *Menopoma*, *Menobranchus*, *Cryptobranchus*, *Siredon*, and *Lepidosiren*. The blood-disks of the Proteus were long regarded as the largest known, but a late discovery had shown that they are still larger in Amphiuma. And, so far as regards the blood-disks of Lepidosiren, they must be placed, as the lecturer had long since discovered, among the several Batrachian characters of this singular creature; no true fish has such large red blood-corpuscles. The comparative examinations were all made in the presence of the meeting, and it was pleasing to see how easily Col. Horsley and his guests were led to realise the main points, and to perceive the relation of the size of the blood-disks with the respiratory function, especially when the comparative smallness of the blood-disks of mammals was shown.

July 20*th*.—Several examinations were made regarding the ordinal characters afforded by Raphides in English exogenous plants, and all found to be quite true, after protracted inquiry among numerous specimens of Onagraceæ, Balsaminaceæ, and Galiaceæ, and of numerous plants of allied but exraphidian orders. It was easy to distinguish by the raphidian diagnosis, even in the minutest portion, all species of these three orders from species of any other order of the same alliance as that to which the raphidian plant belonged.

August 3*rd*.—Mr. George Gulliver, of Pembroke College, Oxford, gave demonstrations of the Sphæraphides of the order Caryophyllaceæ, especially in fresh specimens of *Dianthus armeria*, which is not uncommon about Canterbury. The raphidian character of all the British species of *Lemna* was shown in contrast with the exraphidian *Wolffia*, all in fresh specimens from the neighbourhood of Canterbury.

August 17*th*.—The examination of plant-crystals was continued with the same results. A Paper "On the Comparative Anatomy of the British Scaly Reptiles," was read by Mr. G. Gulliver, late scholar at the King's School.

August 31*st*.—The beautiful Lepides of the epidermis of *Callitriche* were examined. They are not unlike in outline to the flat rose-ornament of mediæval architecture, and are very characteristic, though not yet recognised by systematists. The curious trumpet-shaped Micropyles in the egg of *Locusta viridissima* were displayed.

September 14*th*.—1. *How easily to see the Markings of Pleurosigma;* by Colonel Horsley.—It is well known that these markings are so difficult of resolution that much accessory apparatus and very nice management of the light are considered necessary

for the purpose. Thus costly accessories, such as achromatic condensors, Webster's condensor, Reade's prism and hemispherical condensor, and other contrivances for providing suitable illumination are used, much to the profit of opticians. But, Col. Horsley's experiments raise the question whether these expensive appliances may not be altogether discarded ; and though this cannot yet be affirmed, he exhibited in a very simple manner the markings of the valves of Pleurosigma. This was done by taking the light in a plane with the object, and dispensing with the glass reflector and the condensor, so that the only reflected light was derived from the inside of the short plated tube under the stage of the microscope; and the luminous rays thus faintly and obliquely transmitted proved quite efficient in rendering the markings plainly visible under objectives of one fourth of an inch focus.

2. *On Points in the Intimate Structure of British Euphorbiaceæ;* by Mr. Gulliver.—Referring to his memoir on the Latex of plants, published in the 'Annals of Natural History' for March, 1862, the author announced that he had some new points to display to the meeting. Selecting first a fresh specimen of *Mercurialis annua*, he showed that this plant abounds in Sphæraphides, and to such an extent that it affords an excellent indigenous exemplar of them. And the interest of this fact is increased, because it presents a good diagnostic between the genus *Mercurialis* and all the other British Euphorbiaceæ ; and this character, though so easily seen, is quite ignored in the systematic and other works on botany. Nor is it less noteworthy that the very curious starch-sticks of *Euphorbia* afford an equally distinct and sharp character of this genus among the British Euphorbiaceæ; these rods of starch not having yet been found in any British plant of other orders, if, indeed, in any other order native or exotic. The author observed that such characters in this point of view, including those afforded by raphides, hairs and cells of the epidermis of Phanerogams were of great importance, and that it seemed remarkable that only Dr. Lankester and Professor Balfour had yet at all recognised this valuable addition to taxonomic botany.

September 28th.—Sænuris variegata.—Specimens of this worm, each about an inch in length, and collected at Canterbury, were exhibited at the meeting. Whereupon the Honorary Secretary and Vice-President (Mr. Gulliver) gave descriptions as follows :—The present animal is a member of the Bristle-footed Worms (*Annelida setigera, s. Chætopoda*). These being devoid of gills or other special organs for breathing, and commonly androgynous, are known to zoologists as Abranchiate and monoecious Annelida. As shown at a former meeting, the respiratory function in this family is probably carried on by means of the vibratile cilia with which these creatures are so plentifully supplied within the intestinal canal and elsewhere. They have a distinct ventral nervous chain with ganglia ; and a well-marked vascular system, of which the great vessel on the back is the

centre. The blood is red, like that of several other members of the same order, as the common earthworm, &c. *Sænuris tubifex* and *S. vagans* are abundant about Canterbury; but though *Sænuris variegata* is by no means a rare species, no previous record of its having been found here is known. It is the most beautiful worm of its tribe, being very curiously variegated in colour, which appears the more remarkable from the transparency of the creature admitting a view of the great blood vessel. This was accordingly displayed under the microscopes before the meeting, when the contractions of the vessel and the moving blood presented a curious spectacle, and an excellent example of the vascular system of the Bristle-footed Worms. Indeed, from the ease afforded by the transparency of this species for views of the blood-vessels, the viscera, and the vibratile cilia, this creature is highly prized by those zoologists who desire to be eye-witnesses of these phenomena; and no one can behold such curiously complex structures without a feeling of admiration that these animals, seemingly so abject in the zoological scale, have really a marvellous and high organization, including a respiratory apparatus.

Spongiadæ.—The Honorary Secretary while explaining living examples of *Spongilla fluviatilis*, took the opportunity of making some remarks on the very interesting class of Sponges, which has long been bandied about between the botanists and zoologists, (and has not escaped the moralists), but has at length, by common consent, been peremptorily settled in the animal kingdom. A sponge consists of a skeleton or frame-work invested by the soft living or organic parts. There are regular canals for the circulation or rather passage of the water, with mouths or pores to receive the incoming currents, and openings ('oscula') or vents for the outgoing currents, regularly carried on by means of vibratile cilia. All this might seem merely curious; but in truth it is highly important, as relating to central or fundamental phenomena in physiology. The main facts were discovered by Dr. Grant, the eminent Professor of Zoology at University College, now an honoured veteran, still happily spared to that science which he has adorned throughout Europe, and since admirably reflected to Asia and America. And it is remarkable that Harvey's discovery of the circulation of the blood of the higher animals had remained a great fact, for centuries before Grant demonstrated the analogous process in such abject creatures as the Sponges. Of these the soft living part is composed of a jelly-like and amœboid substance (sarcode), receiving air and food through the pores, and very prone after death to prove its animal nature by putrefaction; of which last fact any zoologist who may engage in experiments on the Sponges of our seas and fresh waters is likely to have unpleasant experience. Though the mature Sponge is as fixed as an oyster, at an earlier period of its existence, like the youngest oysters, that sponge had been a tiny and free-roving animal, careering about at its own will by means of its vibratile cilia; and having thus sported through its

infancy, became finally settled down to pass the remainder of its life in some fixed abode, there to fulfil its destiny by perpetuating its species. And this is effected, as is many other low animals—the polypes, for example—in two modes; by the production of buds (gemmæ) which assume the cilia and freedom already mentioned, or by the agency of ovaries. Hence we have an animal belonging to a class far beneath that which includes the oyster; in short, the Sponges form a class, allied or belonging to the Protozoa, and known as Porifera, so named from the inhalent and exhalent orifices before described. The skeleton of sponges is always composed of flexible fibres or laminæ, or of rigid spicules; and these are either of horny matter, of carbonate of lime, or of flint. So we have the orders Keratosa, Calcarea, and Silicea. The horn-like material is soft and elastic when damp, as we are familiar with it in the sponge of commerce; and being of a peculiar nature, is named Keratode, which is chiefly fibroin, a quaternary compound nearly allied to silk, and not found in the Vegetable Kingdom. Thus, besides the zoological characters before mentioned, we have a proof from chemical investigation of the animality of the Sponge. Fibroin of Sponge contains or is associated with a notable quantity of iodine, sulphur, and phosphorus. The Sponges most commonly known, as well as the living specimens of *Spongilla* shown to the meeting, have no particular shape; and indeed from this fact they were formerly included by De Blainville in a class which he called Amorphozoa. But further researches soon proved the insufficiency of this characteristic; as indeed had been exemplified not long since before the East Kent Natural History Society. One of those examples was a large and grotesque form like a big bucket or tub incrusted with a knobbed layer of stone, standing on a thick pedestal, with a gnarled branching base resembling the root of an old tree, and all crusted similarly by the hard mass composed chiefly of microscopic spicules; and thus presenting a shape so remarkable as to become popularly known by the name of Neptune's Cup. It is allied to the genus *Cliona*, came from the Mauritius, and was submitted to the society, on the 27th of April, by the Rev. C. W. Bewsher. Another, of surpassing beauty of detail and regularity of shape, with its spicules so exquisitely arranged as to present a delicacy of filigree or fretwork on the surface that no art could emulate, and the whole fashioned like the horn of Amalthea, is known as Venus's Flower Vase (*Euplectella*); and for an opportunity of examining this elegant form, the society had been indebted to Mr. Sibert Saunders. Venus's Flower Vase came at first from the Manilla seas. On the other hand, the little sponge brought before the meeting on Thursday last is common in Britain, quite shapeless, and not at all remarkable for external beauty; though its skeleton is very beautiful, being composed of colorless spicules of flint, as transparent as the finest rock crystal. Thus this species belongs to the Silicea, as do all the few Spongillæ of our fresh waters. The spicules, displayed

at the meeting, make admirable microscopic objects, easily prepared, and everlasting. All known sponges are marine, except the genus of which the living species then produced is a member. It occurs near St. Martin's Hill, in the vicinity of the Reed Pond, and in several other places down the Stour river, and may be found on posts, sticks, and weeds, in pools and streams, and commonly appears between wind and water.

October 12th.—Mr. Sibert Saunders exhibited lively specimens of *Coryne pusilla*, *Sertularia filicula*, *Alcyonidium parasiticum*, and *Valkeria cuscuta*. Col. Horsley and Mr. Harvey continued their illustrations of the new method of microscopic illumination, and with satisfactory results. Mr. Gulliver gave an Address "On the Objects and Management of Provincial Museums," which is reported in the 'Kentish Gazette,' Oct. 17, 'Land and Water,' Oct. 28, 'Nature,' &c.

October 26th.—The evening was chiefly occupied by Col. Cox's interesting lecture "On Beach Pebbles," including their microscopic structure.

November 9th.—The evening was fully occupied by the most instructive lecture of the Reverend President, Dr. Mitchinson, "On Hypersthene and Amygdaloid," illustrated by numerous specimens collected by him in Skye, and by drawings in water-colours by R. G. Gordon, Esq., Assistant-Master of the King's School.

November 23rd.—Col. Horsley continued his experiments on the effects of different methods of microscopic illumination, especially as regards the appearance of the lines or markings on the valves of *Pleurosigma angulatum*, *P. quadratum*, and *P. hippocampus*, using a quarter-inch object-glass and transmitted light. The results were so remarkable as to throw doubts on the taxonomic value of the current descriptions of the direction of those markings. Thus, in the former two species, the markings appeared either transverse or oblique, according to the direction of the light, so that they could be made to present a transverse course in one light, and a diagonal course in another light, effects that were produced to admiration as often as desired. But in *P. hippocampus* no such effect could be seen; for in this species the lines always appeared transverse and longitudinal, however the light might be managed.

LIST OF BOOKS AND PERIODICALS

BELONGING TO THE EAST KENT NATURAL HISTORY SOCIETY.

British Land and Fresh Water Molluscs, 1 vol. (Reeve)
Bryologia Britannica, 1 vol. (Wilson)
Synopsis of British Sea Weeds, 1 vol. (Harvey)
Flora of Surrey, 1 vol. (J. A. Brewer)
Manual of Geology, 1 vol. (Professor Phillips)
Flora of East Kent, 1 vol.
Morris's British Butterflies, 1 vol.
Ramsay's Physical Geography of Great Britain, 1 vol.
Dallas's Animal Kingdom, 1 vol.
Johnstone's British Zoophytes, 2 vols.
A Catalogue of Rare Phænogamous Plants collected in South Kent in 1829
Memoirs of the Geological Survey of Great Britain, 2 Nos. referring to Sheets 4 and 7
British Hemiptera, Heteroptera, 1 vol., 1865 (Douglas and Scott)
Handy Book of British Flora, 2 vols. (Bentley)
Miscellaneous Botanical Works of Robert Brown, 3 vols.
Recent Memoirs on the Cetacea, 1 vol.
Monograph of British Spongiadæ, by Dr. Bowerbank, 2 vols.
Conybeare and Phillips' Geology, 1 vol.
Bell's British Quadrupeds, 1 vol.
Atlas of British Sea Weeds, drawn by Mrs. Gatie from Professor Harvey's Phycologia Britannica, 1 vol.
Couch's Fishes, 4 vols.
Forbes's British Star Fishes, 1 vol.
Owen's Comparative Anatomy, 3 vols.
Kirby's British Bees, 2 vols.
Smith's English Flora, 4 vols.
Ralf's Desmidiæ, 1 vol.
Nitzsch's Pterylography.
Hooker's Jungermanniæ, 1 vol.
Smith's Diatomaceæ, 2 vols.
Works of W. Hewson, F.R.S., 1 vol., edited by G. Gulliver, F.R.S.
Parker's Structure and Development of the Shoulder Girdle and Sternum in the Vertebrata, 1 vol.
Lyell's Principles of Geology, 10th edition, 2 vols.
Masters's Vegetable Teratology, 1 vol.
Bevan on the Honey Bee, edited by Major Munn, F.R.H.S., 1 vol.
Gosse's Marine Zoology, 2 vols.
Haughton's Three Kingdoms of Nature, 1 vol.
Westwood's Modern Classification of Insects, 2 vols., 8vo.
Rymer Jones' Outlines of Organization of Animal Kingdom, 1 vol.
Quekett's Lectures on Histology, &c., 2 vols.
A Monograph of the Gymnoblastic or Tubularian Hydroids, by G. J. Allmann, M.D.

PAMPHLETS.

British Moths, Nocturni.
,, Geometræ.
Memoirs pour servir á la connaissance des Crinoides vivants, par Michael Sars.
Etudes sur les Affinites Chimiques par MM. Guldberg et Waage.
Notes on Lemnaceæ and the Raphidian Character of Plants, by G. Gulliver, F.R.S.

Sketches to a scale of the Auditory Organs of Moluscs, by G. Gulliver, F.R.S.
On the Muscular Sheath of the Œsophagus of the "Aye Aye" (Chiromys Madagascariensis), by G. Gulliver, F.R.S.
On the Fibres of the Crystalline Lens of the Petromyzonini, by G. Gulliver, F.R.S.
The Diatom Prism and the true form of Diatom Markings. The Microscope Prism and the Structure of the Podura Scales, by the Rev. J. B. Reade, F.R.S.
Le Glacier de Boinon, per Mons. S. A. Saxe.
On a Fern-stem (Osmundites Dowkeri) from the Eocine of Herne Bay, by Mr. Carruthers.
On the Chalk of Thanet and East Kent, by G. Dowker, F.G.S.
On the Œsophogus of Sauropsida and other Vertebrata, by G. Gulliver, F.R.S.
On the Red Corpuscles of the Blood of Moschus, Tragulus, and Orycteropus, by G. Gulliver, F.R.S.
Crustacea Amphipoda Borealia et Arctica, by Axel Boeck.
Phanerogamer og Bregner, by A. Blytt (from the Royal University of Norway).
Third Annual Report of the Folkestone Natural History Society for 1871.
First Report of the Proceedings of the Croydon Microscopical Club for 1871.
Third Annual Report of the Eastbourne Natural History Society for 1871.

PERIODICALS.

Natural History Review, vol. 3 1863, and vol. 4 1864.
The Zoologist, from 1843 to 1861, and from 1863 to 1869.
N.B.—The Zoologist for 1862 is incomplete.
The Quarterly Journal of Microscopical Science, old series, vol. 7. 1859, and vol. 8, 1860, new series, vol. 1, 1861, to vol. 8, 1868, vol 2 excepted.
Magazine of Natural History, third series, vol. 3, 1859, to vol. 8, 1861, and vol. 11, 1863, to vol. 23, 1869.
The Geologist, vol. 2, 1852, vols. 3, 4, 6, and 7, 1864.
The Phytologist, vol. 3, 1859.
The Geological Magazine, vol. 1, 1864, to vol. 6, 1869.
Quarterly Journal of Science, vol. 1, 1864, to vol. 6, 1869.
Quarterly Journal of the Geological Society, vol. 20, 1864, to vol. 25, 1869.
The Natural History Repertory, 1865.
The Monthly Journal of the Royal Microscopical Society, 1st vol., 1869.

The Librarian regrets to state that in consequence of several Periodicals not having been returned to the Library, nor any entry of them made in the book kept for the purpose in the Society's reading room, he has been unable to have the volumes to which they belong bound.

THE FOLLOWING PERIODICALS

ARE TAKEN IN BY THE SOCIETY, VIZ. :

1. The Annals and Magazine of Natural History.
2. Monthly Journal of the Royal Microscopical Society.
3. The Zoologist.
4. The Geological Magazine.
5. Quarterly Journal of the Geological Society.
6. Science Gossip.
7. The publications of the Ray Society.
8. Seemann's Journal of Botany.

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EAST KENT NATURAL HISTORY SOCIETY.

TITLE & OBJECTS OF THE SOCIETY.

The objects of the East Kent Natural History Society shall be the Collection and Diffusion of Practical and Theoretical Knowledge respecting Natural History, in all its Branches, both in relation to the particular District and the General Science.

Rules and Regulations.

MEMBERSHIP.

1. The Society shall consist of Ordinary, Honorary, and Corresponding Members, and of Associates.

2. Every candidate for admission into the Society as an Ordinary Member, must be proposed in writing by two Members, and the election shall be by show of hands or by ballot, taken at any meeting of the Committee, or at a General Meeting—one negative in five votes to exclude.

3. The Annual Subscriptions to be paid by Ordinary Members shall be Ten Shillings; the Subscriptions shall become due on the 1st of January in each year, and shall be paid in advance for the current year. Any Member neglecting to pay his Subscription for three months after it is due, shall be applied to by the Treasurer or Secretary, and if the Subscription remain unpaid for three months after such application, he shall cease to be a Member of the Society.

4. The Committee shall have power to admit, without ballot, on the nomination of two Members, any Lady who shall be desirous of becoming an Ordinary Member, and her Subscription shall be Five Shillings. This rule shall apply also to such sons, brothers, and nephews of Ordinary

Members, as may be regularly resident in the same house with those Members.

5. Any persons distinguished for their researches in Natural History, for their liberality to the Society, or for their connection with similar Societies, may on the recommendation of the Committee, be elected Honorary or Corresponding Members of this Society, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subjected to any of the expenses of the Society, and shall have no vote in its affairs, nor be entitled to take books out of the Library, nor to the Reports and Notices.

6. In order to encourage the study of Natural History among individuals of the class of Mechanics, &c., residing in the district, the Committee shall have power to admit individuals of that class as Associates, provided they shall first communicate some information or observation on Natural History, exhibit such specimens or present them to the Local Museums, as shall by their merits satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

MANAGEMENT, AND BUSINESS MEETINGS.

7. The affairs of the Society shall be conducted by a Committee of Management, which shall consist of a President, Vice-Presidents, a Treasurer, and an Honorary Secretary, and not less than six Members, who shall all be chosen at the Annual Meeting. Three Members of such Committee shall form a quorum. The Meetings shall be held at four o'clock p.m. on the first Saturday of every month, and at such other times as the Secretary may deem necessary. At any regular Meeting including a sufficient number of Committee-Members, they may then and there declare themselves and act as a Committee in the ordinary business of the Society.

8. An Annual Meeting shall be held, at four o'clock p.m., on the last Tuesday in January, in each year, at Canterbury, for the purpose of electing the Officers for the current year, receiving the Annual Statement of Accounts, and Report of the Committee, and conducting the general affairs of the Society. In case of necessity, the Committee may alter the hour, posting due notice thereof in the Society's room.

9. Special General Meetings may be summoned by the Committee, or by the Secretary, on the requisition (in writing) of any six Members of the Society, the specific purposes of the Meeting being stated in the notice, which shall be sent to each Member not less than one week before the time of such Meeting.

10. All questions discussed at the Meetings shall be decided by a majority of votes; and if upon any question the votes shall be equal, the Chairman of the Meeting shall have the second or casting vote.

11. In the event of any vacancy occurring in the Officers or Committee, between the Annual Meetings, the same shall be filled up by the Committee. The two Members who have been longest thereon, and have attended the fewest meetings thereof, during the preceding year, shall go out by rotation at the Annual Meeting.

12. In order to facilitate the objects of the Society, the Committee shall be empowered to appoint any member a Local Secretary for the town or district he may reside in. Such Local Secretary shall be *ex-officio* a Member of the Committee.

SCIENTIFIC MEETINGS AND EXCURSIONS.

13. The Meetings for Scientific Business shall be at seven o'clock p.m., on the first Thursday of every month at Canterbury; also extra meetings at such place and time as the Committee shall have posted due notice of in the Society's apartment. Each Member to have the right of introducing a Visitor at these Meetings.

14. There shall be ordinary Excursions on the Afternoon of the day of each Evening Scientific Meeting, and at other times if the Committee so appoint, time and place to be duly notified in the Society's room by the Committee; and Special Excursions at such times and places as may be approved by the Committee, who shall consider written suggestions of Members on the subject.

15. Minutes of the Proceedings of all Meetings shall be entered by the Secretary in a Book kept for that purpose.

16. The Secretary to give seven days' notice of Special Excursions to every Member, stating the time and place thereof, &c.

LOCAL OR DISTRICT MEETINGS.

17. To promote still further the objects and interests of the Society, Local Secretaries and Members are invited to organize Meetings or Excursions in their district; and to give notice of the same to the General and all the Local Secretaries; stating the time and place of Meeting, and what particular subjects are to be brought forward.

COLLECTIONS OF SPECIMENS.

18. The Society, as soon as it may possess sufficient means, shall en-

deavour to make a Collection of Objects of Natural History, both with a view of forming a Museum and distribution of Duplicate Specimens, according to the Regulations to be adopted by the Committee.

LIBRARY.

19. Only Books and Periodicals connected with Natural History are to be purchased by the funds of the Society, and the number and particular books of this class to be purchased shall be determined by the Committee.

20. All the Books and Periodicals shall be kept in some convenient place, so that Members may be able to refer to them, or take them out, under such regulations as the Committee from time to time may think proper to make.

21. Members are also invited to lend Books for the use of the Library, reserving to themselves the full right of ownership; such Books to be under the care of the Committee, and not allowed to be taken out of the Library.

22. In order to allow the Librarian to examine the Books, they must all be returned to the Library and none taken therefrom during the first week in every June.

ON THE OBJECTS AND MANAGEMENT OF PROVINCIAL MUSEUMS.

BY THE HONORARY SECRETARY.

Although every intelligent person knows more or less what these institutions are, and what they ought to be, there is probably no subject, connected with the modern means of education in natural science, concerning which so much misconception or ignorance is manifested and tolerated as in the Management and Objects of our Provincial Museums. The majority of them throughout England present such examples of helpless misdirection and incapacity as could not be paralleled elsewhere in Europe. Some noteworthy exceptions there are, as at Ipswich, Ludlow, and elsewhere; and in some parts of our own county, an intelligent spirit has of late been shewn. The municipal authorities at Folkestone have not only consigned their Museum to the care of the Natural History Society of that place, but have given besides some pecuniary aid, while the apartments are now gratuitously available for the scientific meetings. At our great Universities, too, such judicious and honest activity has prevailed as is beyond all praise and puts them out of the pale of strictures applicable to other quarters. And no wonder, seeing that at Oxford and Cambridge competent and eminent men are at work, and not at all disposed to admit of the incubus of meddling and tncompetent persons. But generally the managers or guardians of ohose Local Museums that are supported by public rates are precisely if this unfit class, and seem to have no more notion of their charge than as mere curiosity shops; and even display less intelligence than is shewn in such shops, where the cupidity or shrewdness of the dealer induces him at least to take due care of, and give a local habitation and a name to, his wares. But in the Provincial Museums even this care and tittle of information is withheld, and the visitors are left to do the best they can amid the surrounding bewilderment. This is commonly made up of a most puzzling jumble of heterogeneous miscellanies, arranged or rather scattered with an equally sovereign contempt for the convenience or instruction of the public, and indeed all in such admired disorder as may most plainly show how Chaos is come again and Confusion can make his masterpiece, and how every specimen added to the heap only tends to increase or perpetuate the miserable derangement. It looks as if the presiding local genius had set his wits to work in order to prove how much time and money might be most effectually expended with the least profit to a knowledge of the natural history, or any history, of the

neighbourhood; and indeed for exemplifications of the solution of this knotty point we have too commonly only to appeal to the Museum of the place. Instead of methodical illustrations of the natural history and antiquities of the district, we are likely to find a few good things overlaid by such a rabble-rout, such a multifarious and disorderly medley of outlandish and queer odds and ends, as are rather fitted for a laughing stock than a sober exposition of science. Thus we are met at once in the hall and saloons by such incongruous lots as effigies of double women, elephants' teeth, nose-rings, brain-stones, tomahawks, stuffed alligators, moccasins, New Zealanders' heads, Chinese slippers, cockatoos, canoes, Babylonish bricks, boas, javelins, lions and tigers, calumets, matchlocks, palm-branches, shields, monkey-stones, sugar-canes, Roman cement, Oliver Cromwell's watches, fabricated elephants, Egyptian mummies, and numberless other eccentric things of this motley and confounded order. The garniture of Romeo's apothecary's shop, or the countryman's museum on the barn-door, would be more instructive or intelligible and less ridiculous or perplexing.

It might be painful or appear invidious to inquire minutely by what means or under whose misconduct so many provincial museums have sunk into their present disgraceful confusion and uselessness; especially as it is little creditable to the intelligence of that community under the tolerance or approval of which this reproachful state of things exists. If the fault be attributable to the apathy or something worse among the majority of the ratepayers, it is one that the friends of popular government should hasten to correct. However this may be, it is enough for us to know that this notorious evil has increased, is increasing, and ought to be diminished; it will otherwise remain a foul blot on and a costly nuisance to the places under such miserable infliction. Hence every naturalist and antiquarian, every friend to the progress of education, every intelligent and honest member of the community, should be ready to lend his hand cordially to the good work of reform in this direction; and more especially so, as in truth the difficulty is by no means insuperable, but may be easily removed, while this consummation is devoutly to be wished, and would involve no addition to the customary and regular expense. The remedies are sufficiently obvious, and to point out how they should be used, after having described the disorder and the necessity for them, is the object of the present observations. To this end we have in the first place to consider what is desirable and practicable. To instruct ourselves and the rising generation, by means of local museums, in the elements of natural history generally, and in the local examples of it particularly, is obviously both practicable and desirable. For the first purpose, when indigenous specimens are wanting we must get exotic ones; and these should be limited to such only as are absolutely necessary for the elucidation of fundamental or comprehensive facts; for which purpose anatomical preparations, whether botanical or zoological, are chiefly, but not exclusively, to be esteemed. On the other hand, all and every species belonging to the district should be preserved and displayed so far as they admit of it; partly for the knowledge they convey of the science, but principally for the information they afford of the natural history of the locality. Antiquarian objects should be treated in a similar spirit. Thus would be collected at one view, or

at least under one roof, much of that important knowledge which is within the means and scope of any country Museum, so that every visitor to it might easily find therein both pleasure and profit on natural science in general and on the natural features of the locality in particular. The Museum would then also be in a condition to fulfil one of its leading offices, as a centre for the meetings, lectures, and conversations on the natural history and antiquities of the district, and in this mode be available for contributions in furtherance of the special objects of local societies, and likely thus to add to the general stock of knowledge. And happily this is now being regularly ventilated and popularized in many useful periodical publications. When will the *Times*, looking beyond the dense and sterile mists of the Education Boards, discover the fair and fertile field of instruction in the Provincial Museums, now lying waste for want of culture?

As to such young persons as may show a taste for natural science, it is plainly our duty to give them fair opportunities of learning how and what to observe; and for this purpose judiciously conducted Provincial Museums would be eminently fitted. But attempts to cram or force the tender mind will not be successful. And for this reason we might question the sanguine expectations of the good effects of teaching in provincial or branch schools such curious specialties as animal physiology, light, heat, acoustics, magnetism, and electricity. Yet these were the very subjects, according to a report in the *Folkestone Express*, October 14th, 1871, so strongly recommended by the itinerant lecturer or inspector of the Kensington Science and Art Department, after he had warmly eulogized the generosity of the Government in furtherance of such views. But it is remarkable that there is nothing in the report of his lecture as to how that knowledge of anatomy is to be acquired, which is the very foundation of physiology; nor of the use in this and so many other respects that might be derived from Provincial Museums. Indeed, he seemed to ignore them altogether! And thus, at least, he has taught us what we have to expect from official and expensive Inspectors of Science and Art.

A reference to the "Natural History and Antiquities of Selborne," originally published in 1788, by the Rev. Gilbert White, will show how much even a single individual might achieve for a rural village, and indeed for all time and every place. We cannot expect to make many Gilbert Whites; but with the local Museum properly managed, all its contents plainly marked, and the whole systematically described in the catalogue, we should at least diffuse a taste for and knowledge of natural science. In a collection made thus readily available, and ever before us, the masters and tutors of schools, and other teachers, would be induced by the facilities afforded to bring and help their pupils to the enjoyment of that banquet of free and easy instruction. To many competent persons again it would be a pure labour of love to explain or give lectures on the various departments thereof, and to enrich them by suitable donations. Thus these Museums would be rescued from their degraded position of worthless shows, to fulfil some of their best purposes; and surely this is no more than we ought to expect and have a right to demand, not only for ourselves, but in behalf of the intellectual culture of the rising generation. It seems amazing that, amid all the Babel of late about public schools, this Museum question has

never been properly recognized; but has been fatally swamped or smothered, it is to be hoped not finally, by sectarian rivalship, tonic sol-fa-ism, woman's claims, girls' rights to be taught drawing and how the laws of health and physiology are to supersede the needle and cookery, and much more of such a tangled web of gibberish as only a return to that balance of the faculties known as common sense can sweep clean away.

But how are you to get the desirable specimens, and what are you to do with them when they are at your disposal? Most of those wildernesses miscalled Museums already possess a large quantity of objects only awaiting and inviting intelligent attention. This will consist in a careful preparation, display, and description of them. After having been separately grouped under their respective kingdoms—the mineral, vegetable, and animal—they must be arranged, according to the method of their natural relations, in their respective classes, orders, families, genera, and species; then accurately numbered, ticketed, and catalogued. Thus the otherwise chaotic mass of particular facts will fall into an orderly method, and be always ready to convey an accurate knowledge to visitors. Still further illustrations will be requisite, especially as regards fundamental and comprehensive phenomena, by preparations to display the essential characters, at least, of the classes and orders, and of the anatomy and physiology of the members thereof; and a few careful dissections will commonly be sufficient for this purpose in each order. And now will arise the question, who is to do all this work? Certainly neither by nor under the direction of persons quite incapable of it can we expect any effectual labour of the kind. But with proper encouragement students of and even adepts in the different departments will, from a pure love of the subjects, not only be found to perform all this, but probably more, and without the least expectation of any pecuniary reward. Such persons will surely add important preparations and other objects to the collection, whenever it becomes manifest that their contributions will be duly appreciated and cared for; indeed, with regard to at least one Museum very zealous and skilful naturalists have only been prevented from giving such desirable aid by a knowledge that their work would simply be "missing," contemned, smothered, or destroyed, amid the carelessness and the maze of misplaced rubbish, there undergoing a like fate, and most significantly and effectually warning them, and others like them, what they might expect were they to attempt such services. Fortunately minerals and antiquities are commonly less perishable.

Having discussed what is desirable and practicable, we come to that which is neither one nor the other. And having somewhat irreverently adverted to the rubbish of so many provincial Museums, a further explanation may be necessary, and the more so as this very accumulation of jumbled and useless materials is the sad *bête noire* of these collections, and so vigilantly intrusive as to force admission and predominance against all reasons of fitness or utility. Any disorderly materials when hurtful by being out of place fall into the character of rubbish, just as any plant is a weed when encroaching injuriously on the legitimate crop. In their proper place they may be very valuable; such they might be in the great general collection of the British Museum, or in a botanical garden. But nobody in his senses can suppose that it is either

desirable or practicable for a provincial society to attempt an imitation of that vast and boundless metropolitan institution. This would be simply out of the question, and calculated only to provoke a smile, except peradventure among the guardians of the local Museums. Indeed, with all the excellent arrangement, the army of properly paid experts, and immense space and appliances, the British Museum has become so crowded and unwieldly, especially for reference and use concerning British products, that some steps for an extrication of them from the surrounding masses of exotic things has become necessary. Accordingly the worthy veteran, Dr. J. E. Gray, at the head of the zoological department, has had to rescue the British animals from their former inconvenient obscurity; and for this considerate foresight, and action thereon, that eminent naturalist is entitled to the cordial thanks of all students of British Zoology. But the guardians of the provincial Museums will reasonably ask, granting that we have so much rubbish, what are we to do with it? Sell it if you can, or give it away; but by all means get rid of it, and that swiftly; to which end a bonfire might be the best thing. And having thus learned by experience the noxiousness of such rubbish, most resolutely and remorselessly refuse any quarter to it in future. At present this sort of lumber only occupies space and involves expense that might and ought to be employed for more useful and legitimate purposes; and how and why has already been mentioned. At the execution of the sentence many a wailing throe will out, some natural tears be shed, for the o'erfraught heart will speak. The very civil and complacent local genius, especially when he is paid out of the public rates, will meekly plead for his idols, telling you how he loves them, and how some other equally wise and more potent individuals hold the same faith; and above all that the visitors to his temple have ever regarded all those very things with an admiration and delight amounting to veneration. He will refuse to be comforted by your sincere assurance that every one of his words is no doubt very true, though Punch and Judy, and Madame Tussaud, may be almost as delightful if not quite as good in their way; but that your way is to show how the provincial Museum may be made not to suppress or degrade but to develope and elevate the taste of the multitude; and that after all a good Museum will sooner or later become more popular than a bad one.

But the higher functionaries of the committees or managements will be less meek and docile than their subordinate official, less open to reason, most impracticable, and most active or rude in justifying their culpable neglect, precisely in proportion to their ignorance of their duties. However, supposing all these obstructions fairly removed, there will still arise further but petty difficulties in carrying out the needful details as to the treatment of the various objects which may be considered worthy of care in the provincial Museum, and, indeed, in any Museum. Among these the most constant and vexatious are the tendency of valuable donations to be "missing;" to leave specimens without mark or number and out of the catalogue; to neglect due acknowledgments to the donors of objects; to see a lion in the way, unless somebody or his friend can be induced to frighten this bugbear; and above all for paid attendants to delegate little duties unreasonably, and to have heart and head anywhere rather than in the Museum. These, from a

somewhat extensive experience, while your Honorary Secretary was in charge of the Museum of the Army Medical Department, and subsequently Chairman of the Museum Committee at the College of Surgeons, were the small details which he found usually requiring most vigilant attention. But they are easily overcome by judicious care, and sometimes never give any trouble. A plain Code of Rules for the Museum is quite essential. Everything received at the Museum should be entered by the keeper or porter, first in a Waste-book, and then submitted in due course to the proper authorities, by whom will be noted the destination of the specimen, as may be decided on; such as "thanks, but unfitted for the Museum;" or "thanks, and to be varnished, labelled, and catalogued," &c. And finally by turning to that simple Waste-book any one might see what had become of every addition to the Museum, whether acquired by purchase, donation, or otherwise, while that most curious article of all too well known as "missing," would be held in particular check. And the catalogue, being duly kept, would of course be the ever-ready record of precisely all that information which is to render our provincial Museum most valuable. And no excuse should be permitted for neglect or evasion of such essential points as all these assuredly are; nor should the keeper or porter be for a moment allowed to shirk or delegate the making of the preliminary registries, the lists of such books or other miscellanies as may belong to the collection, and the due care of every thing therein, including the correctness of the labels.

And now, having said so much of the Museums scattered throughout the country, we might be expected to look nearer home, and to answer a very pertinent question that may be put to us. "If you are so wise, why don't your Society put some of this wisdom in practice?" Simply because we have at present neither the apartments, servants, nor money which would be required for the purposes of a Museum. The Society is poor in everything but honest zeal, and has been heretofore struggling, in a small apartment and at large expense, to maintain its existence and usefulness to the best of its means, with little patronage by the public and still less by the great, and in the face of many difficulties, some of which have already been intimated. Yet we have succeeded and have a good prospect of still better speed. Something further we might be expected to say concerning the Canterbury Museum in particular. But this is better avoided. Former representations by respected members of the East Kent Natural History Society, Colonel Cox and Mr. Dowker, by its Honorary Secretary, by the Editors of the *Kentish Gazette*, and by other persons connected with the neighbourhood, have all been disregarded. Nor has the remonstrance in a late Report by your Committee, though unanimously adopted at the General Annual Meeting of your Society, met with any better fate. And, indeed, nothing on the subject has received the least attention by the guardians of our City Museum but the last appeal from London by Mr. Frank Buckland. Whatever may be the fate of his kind interest in the subject, we should be thankful for his good intentions: and indulge the hope that the day may come when the City Museum and the East Kent Natural History Society will be found working harmoniously and usefully together. And it only now remains to

add that the present observations are intended generally for those several Museums in different parts of the country that appear to have abandoned their duties, especially when these are owing to the ratepayers, and by no means for any special application to the Canterbury Museum. As already mentioned, this Institution has not profited by the former complaints or expostulations. Perhaps that untoward result may have been owing mainly to the supineness of the public, or a want of taste here for natural science; and if this be the fact, it is a surprising and deplorable one in the city where William Harvey was educated and George Newport was born. But, recognising the great truth, so well taught by John Ruskin, that all highest Art must be founded on Nature, we may still hope much from a city that has produced Sidney Cooper and Henry Weekes.

East Kent Natural History Society.

MEETINGS, 1872-3.

SCIENTIFIC on THURSDAYS at 7 o'clock p.m.

March	7, 1872.	September	5, 1872.
April	4, ,,	October	3, ,,
May	2, ,,	November	7, ,,
June	6, ,,	December	5, ,,
July	4, ,,	January	2, 1873.
August	1, ,,	February	6, ,,

COMMITTEE on SATURDAYS, at 4 o'clock p.m.

February	24, 1872.	August	31, 1872.
March	30, ,,	September	28, ,,
April	27, ,,	October	26, ,,
May	25, ,,	November	30, ,,
June	29, ,,	December	28, ,,
July	27, ,,	January	25, 1873.

ANNUAL MEETING,

TUESDAY, JANUARY 28, 1873, at 4 o'clock p.m.

FIFTEENTH REPORT

OF THE

EAST KENT NATURAL HISTORY SOCIETY,

ADOPTED AT THE

ANNUAL MEETING,

HELD ON JANUARY 28th, 1873.

CANTERBURY:

PRINTED AT THE "KENTISH GAZETTE" OFFICE, HIGH-STREET.

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CONTENTS.

East Kent Natural History Society.

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THE PRESIDENT'S ADDRESS.

The Rev. Dr. MITCHINSON said :—The subject of my address to you to-day will be the utility and the dangers of Provincial Natural History Societies. People are disposed sometimes to take their utility for granted, on the ground that a subject so interesting as Natural History—so manifold in its bearing on common life—must needs be of great utility to all, especially to the rising generation. Now I am not disposed to set a high direct educational value on such associations. I do not myself believe they can ever resolve themselves into miniature local science universities, imparting scientific teaching in its different branches to young and studious persons. In the first place there is not the teaching power. There are not enough really able men in any such local centre, each of them sufficiently master of his subject to venture to impart his stock of knowledge to others. Nor does it follow that, granting the possession of the necessary erudition, and of the necessary command of time, that such men of science have the rare gift of teaching others—of seeing difficulties, and gradually building up the pile of knowledge. Moreover, in the acquisition of scientific knowledge, above all other kinds, mere imparting of facts is valueless to the student. He must work for himself, observe, register, read, question, and eventually blunder his own way to any knowledge worth the name. But a Natural History Society is useful first to these very men of science themselves. There is always a sprinkling of such,—men with a hobby,—often busy men, but still men who have retained in middle and later life all their boyish enthusiasm in the pursuit of their scientific hobby: and to such men to find fellow-workers, sympathetic minds,—not necessarily working in their groove, but running alongside them in parallel grooves,—is an encouragement and a stimulus. Secondly, it is useful to the young folk of the neighbourhood, in that it opens out to them a new circle of ideas, creates new tastes, encourages pursuits healthful to mind and body, suggests an antidote to the exclusive domination over the mind either of boyish athletics or feminine frivolity. It brings them, too, within the range of minds more trained to scientific observation than their own. They learn how to set about and how best pursue the path through nature's works they have selected. They learn what errors to avoid, what methods and habits of mind to cultivate. They learn the mere manipulation of the microscope,

the dissecting knife, the pocket-lens. They get the invaluable advantage which every novice requires—direction and encouragement. Thirdly, such societies are directly useful to the future of science. Old-fashioned people like myself who were trained in the rigid inductive school of Bacon, and who look askance at "The Scientific use of the Imagination" which our new lights so confidently inculcate, believe in the enormous value of fact-accumulation, of patient, carefully sifted, and carefully registered observations, in every branch of natural science. And it is this that such local clubs can best achieve. If it be true that science is built up on piles of monographs, then it is no less true that the practical monographs, *i.e.*, the result of carefully digested observations made by accurate workers in local districts are the stuff of which the really valuable generalizations of our scientific posterity will be composed. Nor, must I omit from the uses of Natural History Societies like ours, the advantage to all alike, to the man of science and to the babe that is to grow into the man, of standard works on every branch of science elucidating and correcting personal observations, and of those scientific periodicals which keep us all abreast of the progress of scientific discovery throughout our own country and throughout the world. And now for a word or two as to the dangers of Local Natural History Societies. Their chief danger is that they are prone to encourage superficiality, especially in young students. The study of classics, whether modern or ancient, and of the exacter sciences, does not lie open to this insidious peril. Those who would show knowledge in these must needs possess it or the imposture is very speedily unmasked. Not so with the natural sciences. In these a very little knowledge goes a very long way. An intelligent lad or girl soon picks up enough of fact, and enough of scientific phraseology, effectually to impose upon themselves,—for the imposture is quite unconscious, and so far innocent,—and enough to throw dust in the eyes of others. Care ought to be taken in mixed scientific meetings that every paper read should be thorough and searching, and those who read or speak should not think it beneath the dignity of the occasion to condescend to the unlearned, to enter gladly into detailed explanation and to encourage free questioning. There is another way, however, in which societies for the promotion of natural science may serve to retard, not promote it in any neighbourhood; and that is when the morbid mania for wholesale collecting is widely spread, and threatens a rare flora or fauna with extinction. Perhaps collecting is inseparable from the thorough study of botany and zoology; no surer sign, however, exists of the spurious pursuit of either or both of these sciences than when rare plants are torn up, and rare animals made still rarer by that selfish acquisitiveness which passes with so many for love of science. No doubt every botanist should secure the entire plant of all typical species, common as they are, thanks to Nature's lavish prodigality. But is it not a blot on the fair fame of science that the chalk woods of Kent are now searched in vain for Orchis Hircina, and the basaltic crags of Upper Teesdale for Woodsia Ilvensis, all because greedy collectors have obliterated every trace of them with their wanton selfish trowel. Turn to Zoology. If by chance any rare butterfly appears on some sheltered hedge-bank, or rare bird along

some lonely seashore or inland mere; what happens? Is the visit carefully recorded, and the shy stranger encouraged to re-visit its chosen haunt? No. The butterfly is secured by the first salesman to be purchased by soidisant savants, and the bird shot, and badly stuffed, or given to the cat. It is the paramount duty of a Natural History Society to frown down such miserable selfishness, such destructive rapacity. It is its business to husband every rarity that careful research brings to light within its district with jealous care as the heritage of posterity. It is its business carefully to note the occasional appearance, and sometimes thorough naturalization of exotics, whether plants or animals, and above all things to remember that it is but the trustee of these good gifts of the God of Nature, not their prodigal and ungrateful spendthrift.

REPORT OF THE COMMITTEE.

The Society has probably never been in a more prosperous state than at present. At the end of the year 1871 the balance to the credit of the Society was £7 19s. 6d., and this was increased at the corresponding period of 1872 to £12 12s. 3d. And during the past year there has been an increase of 19 in the members, making the total 109 on the 31st of December last.

The report of the Librarian will show that the important department of the Library has been much enriched at little expense during the year, and is now such a very useful collection for reading and reference as would in itself prove an ample remuneration for the small annual sum paid by the members. Your committee moreover recommend that a sum of £5 be added to the library fund during the year 1873.

As to special excursions, the committee have not had before them any proposal from members according to the suggestion in Rule 14; but ordinary excursions, in compliance with the same Rule, have been frequent and profitable. And indeed it is a peculiar and useful practice of the Society to examine and explain such objects as may be collected during these excursions, as well as any other materials that may be extemporaneously brought before the scientific meeting. This course has been found valuable to all concerned, especially as it is not encumbered with any sort of preliminary formality, save such slight regulation as may be then and there decided on for the economy of time. Thus there is a free and easy intercommunication of knowledge very pleasant and profitable to the members and their friends.

Of course the Library, always ready at hand for assistance, is becoming more and more valuable in this and other respects. And to increase appliances for observation and instruction, the committee, acting on the hint of Mr. Sibert Saunders, recommend that a microscope, at a cost not exceeding ten guineas, should be purchased for the use, under such restrictions as may appear necessary to the Committee, of the members of the Society. They will thus enjoy opportunities of acquiring a knowledge of microscopic manipulation, which has now become absolutely indispensable in scientific education and research; and those already

in possession of this knowledge will have a good instrument ready at hand for the examination of the numberless objects which require the aid of the microscope.

The reports of the scientific proceedings in the *Kentish Gazette* are well known for their accuracy and completeness, and are kept by the Hon. Assistant Secretary in a book for reference. Of these copies have frequently appeared in various journals, and abstracts so regularly and judiciously, in the *Quarterly Journal of Microscopical Science*, that your committee have secured copies thereof for the Annual Report of the East Kent Natural History Society. And it is believed that these short abstracts will afford at one view a more succinct and regular account of the scientific proceedings than has yet appeared in any Annual Report of the Society; and show that it has, besides providing a regular course of rational amusement, done some good and original work towards the advancement of science. In short, it may be reasonably hoped that the scientific proceedings of the Society have already tended, and may still further tend, to the promotion of one of its most cherished objects, that of creating or developing a taste for natural history in the district. And this, so far as regards the young, not to displace the valuable mental training of the venerable mathematics and classics of the schools, but to run side by side in generous emulation, whenever the scholar may prove by his inclination and capacity to be worthy of encouragement in the race.

In conclusion, your Committee have to remark that the warmest thanks of the Society are due to its President, to its Treasurer and Librarian, and to its Honorary Secretaries. The labours of Colonel Horsley in keeping the accounts, and in providing on the most advantageous terms the additions to the Library, have been marked by an intelligent zeal rare even in paid officers. And the living treasures of Mr. Fullagar's aquarium have always been ready for the amusement and instruction of the members at the scientific meetings. The contributions of other members are regularly, though briefly, noticed in the abstracts already mentioned. To Colonel Horsley, Mr. Sidney Harvey, Mr. Fullagar, and Mr. R. J. Bell, the scientific meetings have, as formerly, been much indebted for valuable assistance in the microscopic department.

REPORT OF THE LIBRARIAN FOR THE YEAR 1872.

The funds at the disposal of the Librarian during the year 1872 consisted of £1 5s. 6d., being the balance remaining from the library fund of 1871, and £10 from the general fund of the Society, making a total of £11 5s. 6d. Of this sum £4 15s 1d. was spent in the purchase of new books, as mentioned below, £5 8s. 3d. for periodicals, including extra numbers of *Journal of Science*, and *Geological Magazine* to complete the volumes of 1869 and 1870, and £1 8s. 7d. for binding 13 volumes of previous years' periodicals; thus showing a total expenditure of £11 11s. 11d., being an excess

of 6s. 5d. over receipts, which will be made good from next grant. The new works above referred to are—

1. Pulteney's Progress of Botany in England.
2. Pulteney's Account of the Life and Writings of Linnæus.
3. Berkeley's Cryptogamic Botany.
4. Pritchard's History of Infusoria.
5. Baird's Entomostraca, Ray Society 18.
6. Siebold on Parthenogenesis.
7. Barclay on Life and Organization.
8. Carpenter's Comparative Physiology.
9. Micrographic Dictionary, 9 parts of the new edition.

The periodicals taken in by the Society are the same as 1871, with the addition of The Quarterly Journal of Microscopical Science.

In return for the one guinea annual subscription to the Ray Society the following book has been received :—

A Monograph of the Gymnoblastic or Tubularian Hydroids, folio, by G. J. Allman, M.D., Part II.

The undermentioned pamphlets were presented to the Society during the year 1872, viz :—

West Kent Natural History Society's Report for 1871.

Ten Papers by the late George Newport, F.R.S., extracted from the Transactions of the Royal and Linnæan Societies; presented by Mr. R. J. Bell, St. Margaret's Street, Canterbury.

Memoirs on the Blood of Lamna cornubica, &c., by the author, G. Gulliver, F.R.S.

The Bee Keeper's Magazine, one number, by Major Munn.

FINANCIAL STATEMENT FOR 1872.

RECEIPTS.

	£	s.	d.
Balance in hand, 31st December, 1871	7	19	6
Subscriptions received in 1872, including Dover Branch to this date for 1872	36	5	6
	£44	5	0

Examined and found correct, January 23rd, 1873.

GEORGE RIGDEN.

EXPENSES.

	£	s.	d.
Rent of Room in High Street for One Year	10	0	0
Fire and Light at Meetings	1	14	0
Contribution to Library	10	0	0
Subscription to Ray Society	1	1	0
"Kentish Gazette" for Printing	4	10	0
James Gibbs for ditto	0	7	6
James E. Adlard for 200 Copies of our Transactions	2	14	6
Hon. Assistant Secretary Petty Cash	1	0	0
Postage, &c. by Treasurer	0	5	9
Balance in hand 31st December, 1872	12	12	3
	44	5	0

W. H. HORSLEY, Colonel,
Honorary Treasurer.

LIST OF BOOKS AND PERIODICALS

BELONGING TO THE EAST KENT NATURAL HISTORY SOCIETY.

British Land and Fresh Water Molluscs, 1 vol. (Reeve)
Bryologia Britannica, 1 vol. (Wilson)
Synopsis of British Sea Weeds, 1 vol. (Harvey)
Flora of Surrey, 1 vol. (J. A. Brewer)
Manual of Geology, 1 vol. (Professor Phillips)
Flora of East Kent, 1 vol.
Morris's British Butterflies, 1 vol.
Ramsay's Physical Geography of Great Britain, 1 vol.
Dallas's Animal Kingdom, 1 vol.
Johnstone's British Zoophytes, 2 vols.
A Catalogue of Rare Phænogamous Plants collected in South Kent in 1829
Memoirs of the Geological Survey of Great Britain, 2 Nos. referring to Sheets 4 and 7
British Hemiptera, Heteroptera, 1 vol., 1865 (Douglas and Scott)
Handy Book of British Flora, 2 vols. (Bentley)
Miscellaneous Botanical Works of Robert Brown, 3 vols.
Recent Memoirs on the Cetacea, 1 vol.
Monograph of British Spongiadæ, by Dr. Bowerbank, 2 vols.
Conybeare and Phillips' Geology, 1 vol.
Bell's British Quadrupeds, 1 vol.
Atlas of British Sea Weeds, drawn by Mrs. Gatie from Professor Harvey's Phycologia Britannica, 1 vol.
Couch's Fishes, 4 vols.
Forbes's British Star Fishes, 1 vol.
Owen's Comparative Anatomy, 3 vols.
Kirby's British Bees, 2 vols.
Smith's English Flora, 4 vols.
Ralf's Desmidiæ, 1 vol.
Nitzsch's Pterylography
Hooker's Jungermanniæ, 1 vol.
Smith's Diatomaceæ, 2 vols.
Works of W. Hewson, F.R.S., 1 vol., edited by G. Gulliver, F.R.S.
Parker's Structure and Development of the Shoulder Girdle and Sternum in the Vertebrata, 1 vol.
Lyell's Principles of Geology, 10th edition, 2 vols.
Masters's Vegetable Teratology, 1 vol.
Bevan on the Honey Bee, edited by Major Munn, F.R.H.S., 1 vol.
Gosse's Marine Zoology, 2 vols.
Haughton's Three Kingdoms of Nature, 1 vol.
Westwood's Modern Classification of Insects, 2 vols., 8vo.
Rymer Jones' Outlines of Organization of Animal Kingdom, 1 vol.
Quekett's Lectures on Histology, &c., 2 vols.
A Monograph of the Gymnoblastic or Tubularian Hydroids, by G. J. Allman, M.D., parts 1 and 2.
Pulteney's Progress of Botany in England.
Pulteney's Account of the Life and Writings of Linnæus.
Berkeley's Cryptogamic Botany.
Pritchard's History of Infusoria.
Baird's Entomostraca, Ray Society.
Siebold on Parthenogenesis.
Barclay on Life and Organization.
Carpenter's Comparative Physiology.
Micrographic Dictionary, 9 parts of the new edition.

PAMPHLETS.

British Moths, Nocturni.
,, Geometræ.
Memoires pour servir a la connaissance des Crinoides vivants, par Michael Sars.
Etudes sur les Affinites Chimiques par MM. Guldberg et Waage.
Notes on Lemnaceæ and the Raphidian Character of Plants, by G. Gulliver, F.R.S.
Sketches to a scale of the Auditory Organs of Moluscs, by G. Gulliver, F.R.S.
On the Muscular Sheath of the Œsophagus of the "Aye Aye" (Chiromys Madagascariensis), by G. Gulliver, F.R.S.
On the Fibres of the Crystalline Lens of the Petromyzonini, by G. Gulliver, F.R.S.
The Diatom Prism and the true form of Diatom Markings. The Microscope Prism and the Structure of the Podura Scales, by the Rev. J. B. Reade, F.R.S.
Le Glacier de Boinon, per Mons. S. A. Saxe.
On a Fern-stem (Osmundites Dowkeri) from the Eocine of Herne Bay, by Mr. Carruthers.
On the Chalk of Thanet and East Kent, by G. Dowker, F.G.S.
On the Œsophogus of Sauropsida and other Vertebrata, by G. Gulliver, F.R.S.
On the Red Corpuscles of the Blood of Moschus, Tragulus, and Orycteropus, by G. Gulliver, F.R.S.
Crustacea Amphipoda Borealia et Arctica, by Axel Boeck.
Phanerogamer og Bregner, by A. Blytt (from the Royal University of Norway).
Third Annual Report of the Folkestone Natural History Society for 1871.
First Report of the Proceedings of the Croydon Microscopical Club for 1871.
Third Annual Report of the Eastbourne Natural History Society for 1871.
West Kent Natural History Society's Report for 1871.
Ten Papers by the late George Newport, F.R.S., extracted from the Transactions of the Royal and Linnæan Societies; presented by Mr. R. J. Bell, St. Margaret's Street, Canterbury.
Memoirs on the Blood of Lamna cornubica, &c., by the author, G. Gulliver, F.R.S.
The Bee Keeper's Magazine (one number only), by Major Munn.

PERIODICALS.

Natural History Review, vol. 3, 1863, and vol. 4, 1864.
The Zoologist, from 1843 to 1861, and from 1863 to 1869.
N.B.—The Zoologist for 1862 is incomplete.
The Quarterly Journal of Microscopical Science, old series, vol. 7, 1859, and vol. 8, 1860, new series, vol. 1, 1861, to vol. 8, 1868, vol. 2 excepted.
Magazine of Natural History, third series, vol. 3, 1859, to vol. 8, 1861, and vol. 11, 1863, to vol. 23, 1869.
The Geologist, vol. 2, 1852, vols. 3, 4, 6, and 7, 1864.
The Phytologist, vol. 3, 1859.
The Geological Magazine, vol. 1, 1864, to vol. 6, 1869.
Quarterly Journal of Science, vol. 1, 1864, to vol. 6, 1869.
Quarterly Journal of the Geological Society, vol. 20, 1864, to vol. 25, 1869.
The Natural History Repertory, 1865.
The Monthly Journal of the Royal Microscopical Society, 1st vol., 1869.

The Librarian regrets to state that in consequence of several Periodicals not having been returned to the Library, nor any entry of them made in the book kept for the purpose in the Society's Reading Room, he has been unable to have the volumes to which they belong bound.

THE FOLLOWING PERIODICALS

ARE TAKEN IN BY THE SOCIETY, VIZ.:

1. The Annals and Magazine of Natural History.
2. Monthly Journal of the Royal Microscopical Society.
3. The Zoologist.
4. The Geological Magazine.
5. Quarterly Journal of the Geological Society.
6. Science Gossip.
7. The publications of the Ray Society.
8. Seemann's Journal of Botany.
9. The Quarterly Journal of Microscopical Science.

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East Kent Natural History Society.

President, the Rev. John Mitchinson, D.C.L., &c., Oxon.; Honorary Secretary, George Gulliver, F.R.S., &c.

Confining, as before, these reports chiefly to observations involving microscopic work, details will be omitted of extensive business in other departments. But the whole proceedings of the Society are so extensively and accurately reported, at Canterbury, in the 'Kentish Gazette,' as to afford an excellent example of local journalism, or indeed of any journalism; and extracts therefrom appear in many of the scientific and other periodical publications which pay but little or no attention to the microscope.

December 7th, 1871.—The meeting prevented by the snow storm.

21st.—Colonel Horsley displayed the markings of *Pleurosigma quadratum*, under a deep object-glass with the aid of Reade's prism and Webster's condensor, in order to show that the effect is the same as that produced by the simpler method of illumination which he had shown at former meetings. Mr. Down exhibited some deep telescopic eye-pieces successfully adapted to the microscope. Mr. Fullagar presented a preparation, mounted in Canada Balsam, of the egg-shell of *Locusta viridissima*, showing the trumpet-shaped microphyles admirably, Mr. Gulliver gave an account of the big shark (*Lamna cornubica*) which he had seen landed at Hastings, Nov. 10, 1871; and after some observations on the anatomy of the Selachii, and on the wanton waste of good food and oil in the myriads of smaller sharks or dog-fish contemptuously left to rot on our coasts, proceeded to a comparative view, illustrated by dried specimens, of the red Corpuscles of the Blood of Fishes. In the different orders of osseous fishes these corpuscles do not vary much in size and form, though some are of a much longer oval figure than others; and sometimes they are oat-shaped, crescentic, or even triangular or polygonal, all shapes that may be well seen in the Gadidæ, and that might occur from alterations in the regularly oval or sub-oval discs, among which are often seen some of circular figure. In the Cartilaginous Fishes, as is well-known, the blood-discs are much larger; but they seldom present such changes of form, though perhaps those of *Myxine*, long since described by Johannes Müller, might have been misshapen. In the Lampreys, though the red corpuscles are circular, they conform both in size and structure to the red corpuscles of other Pyrenæmata; just as the red corpuscles of Camelidæ, though oval in shape, agree completely in size and structure with the red corpuscles of other Apyrenæmata. As to the blood-discs of the sharks, they are of

about the same size in the great Porbeagle as in the small and common dog-fish, as noticed in the 'Quart. Journ. Mic. Science' for January, 1872. Hewson, upwards of a century since, discovered the large size of the blood-discs of Plagiostomi.

January 18*th*, 1872.—Mr. Bell exhibited a live *Chamæleon vulgaris*, from which some blood was then obtained and its red corpuscles examined. Their mean long diameter was found to be $\frac{1}{1391}$ and their short diameter $\frac{1}{2400}$ of an inch, measurements which correspond nearly with those of the blood-discs of other scaly reptiles. Mr. Gulliver dissected a fresh Smelt (*Osmerus eperlanus*), in order to illustrate a lecture which he gave on the structure of this and the other members of the Salmonidæ. Of the Maxillary Teeth, characteristic of the family, he showed how they were often not represented, even by our best artists, in many of the otherwise excellent paintings and engravings of these fish, a defect which was painful to the eye of the ichthyologist; and that art should, in this as in other cases, take a lesson from nature. The so-called Adipose Fin, commonly described as "without any rays whatever," was shown, under an object-glass of half-an-inch focal length, to be quite devoid of any fat, and provided with a multitude of very thin rays, some of which occasionally project beyond the free margin of the fin. But these rays, being homogeneous, transparent, and structureless, like the fibres of the crystalline lens, and unprovided with muscle for their movements, are not quite identical with the true rays of the locomotive fins. The Fibres of the Crystalline Lens were shown to afford a good example of the sinuous and interlocking edges; and these being compared with those of other fishes, were proved to afford excellent taxonomic characters between different members of the class. Thus, *e. g.* the lens-fibres of the Lampreys are smooth at the edges; of the common Eel but little indented; of the Conger more so; and, of the majority of the class, so very much and deeply notched, as to produce the well-known interlocking or dove-tailing of the margins of the fibres, as is well seen in the salmon-family. Nor is the difference of the diameter of the fibres less remarkable in different orders of the class. The facts were illustrated by preparations, and extemporaneous dissections, under the deep glasses of Colonel Horsley's, Mr. Sydney Harvey's, and Mr. Bell's microscopes, thus showing how easily the objects may be displayed, even by the most inexperienced micrographers, and what really beautiful preparations may be made of these fibres from the lenses of different fishes, ever ready at the shops as well as in the great field of nature. In fact, this kind of microscopic inquiry is at once so useful and delightful, both in the animal and vegetable kingdoms, that it seems amazing that one or other of our great Microscopical Societies has not yet given precise directions concerning the various branches thereof, for the guidance of those numberless microscopists who are now wasting their energies in advertisements and anxious searches for "good stuff for the microscope." But

the worthy veteran Dr. Lankester had taken a right step in this direction, by pointing out what profitable objects the cell-structure of plants might thus afford. And now we have seen how even such a single part as the eye-lens of animals might be easily made into numberless microscopic objects, very beautiful individually and not less useful collectively in the service of systematic zoology.

30th.—The General Annual Meeting was held; and the Report, containing the Address of the President, the report of the Committee, the Proceedings of the Society, and other matters, has since been issued to the members. There was afterwards a recess of several weeks.

March 7th.—Colonel Horsley gave some explanatory sketches of his views concerning his method of resolving the markings of Pleurosigma. Mr. Fullagar produced very small and lively Polyps, bred in his aquarium, as he believed, from autumnal or winter eggs of *Hydra vulgaris*; he showed also neat preparations of the lingual teeth of Planorbis; whereupon the Hon. Secretary detailed some of his own experiments showing, as he believed must be already known, that these teeth in snails and slugs are composed of pure silex, and so no wonder that these creatures should be able to comminute or bore through very refractory substances. Mr. George Gulliver, late of the King's School, exhibited living specimens of *Argas reflexus*, and read a paper thereon, of which the following is a summary:

On a Canterbury Arachnid new to the British Fauna.

Although a great fane in the midst of a populous city might seem an unpromising field for an exploratory excursion of a Natural History Society, we shall soon see that our venerable cathedral harbours a zoological species not yet discovered elsewhere in Britain. This animal is the *Argas reflexus* of Latreille, *Rhynchoprion columbæ* of Hermann, and *Ixodes marginatus* of Fabricius. It is about a third of an inch long and a fifth broad, but many are smaller, and some not more than a fifteenth of an inch in length. They are all opaque, of a dark, dull, and uniform brown color, and with a well-defined entire and paler margin. The coriaceous integument of the under and upper parts of the larger specimens is regularly dotted, and these dots under the microscope recall the shagreen of certain Selachii, and appear to be composed of carbonate of lime; at least they dissolve quickly and completely, with evolution of gas, when treated with an acid. Each foot has at its tip two very sharp sickle-shaped claws, by which the creature holds on to its host; and there is also a tubercle at a little distance from the base of the claws. Though like a tick, no such proboscis as that which distinguishes the true ticks was seen, nor could any eyes be discovered. When punctured, much fluid of a very dark red colour exuded, and this colour was found to be

owing to numerous oblong corpuscles, very variable in size, but those of average magnitude were each about $\frac{1}{1835}$ of an inch long and $\frac{1}{4444}$ broad. They were individually of an intensely deep red colour, and all readily soluble in weak acetic acid, though they retained their form distinctly for many days in water, being not at all soluble therein. On dissection the seat of these curious red bodies seemed to be within the alimentary cæca. There were also many minute molecules in the fluid. This remarkable Arachnid has long been known in the dark recesses of our time-honoured fane, and regarded there as an "Insect peculiar to Canterbury Cathedral." The verger, who gave some of them to Mr. Fullagar, so described them; and of these my father kept a few quite without food, in a tin box, for upwards of five months, during the whole of which time they continued lively, and ever ready, when touched, to sham death, after the manner of veritable spiders. As we could not identify the Cathedral arachnid with any specific description, and were told by some of the most eminent British entomologists that our specimens were nothing but starved sheep-ticks, I took one of them up to Oxford at the beginning of last term, when the illustrious entomologist, Prof. Westwood, declared, and was the first to determine, it to be the *Argas reflexus*, a parasite infesting pigeons, and known on the Continent, but heretofore not recognised in Britain. So our arachnids had probably dropped from these birds, and are certainly to be found rather plentifully crawling about the inside of the base of the cathedral.

East Kent Natural History Society.

President, the Rev. John Mitchinson, D.C.L., &c., Oxon.; Honorary Secretary, George Gulliver, F.R.S., &c.

April 4th, 1872.—*Land and freshwater shells in the neighbourhood of Dover.*—Dr. C. A. Gordon, C.B., Deputy Inspector-General of Army Hospitals, having taken advantage of his station at Dover to examine these shells, of which he had exhibited specimens to the meeting, communicated a formal list of them, as follows:—Succinea putris, S. elegans, Zonites alliaria, Z. nitidulus, Helix aspersa, H. arbustorum, H. nemoralis, H. cantiana, H. carthusiana, H. virgata, H. rufescens, H. hispida, H. rotundata, Bulimus obscurus, Planorbis complanatus, P. spirorbis Lymnæa stagnalis, L. palustris, L. glutinosa, Ancylus fluviatilis, Bythinia tentaculata, Cyclas cornea, Cyclostoma elegans. Dr. Gordon considered the term "Models of Creation," as applied by the late Dr. Mantell to fossil shells, peculiarly appropriate, and gave some interesting and instructive observations on the poetical, popular, and historical associations connected with shells.

Coast Museums.—On the mention of an intended museum of natural science at Eastbourne, Mr. Gulliver gave an account of his views concerning what should be the true object of such collections, and of the absurd errors too commonly exemplified and committed therein; and especially as to the easy means by which museums on the sea coast might be made subservient to the best kind of instruction on marine botany and zoology; and how the numberless microscopes, now employed to little profit, might be at once and for ever, even by unskilful persons, used for the advantage of science and their own intellectual culture. And this question has since been well ventilated in 'Land and Water,' May 11, 1872.

Economy of the freshwater Polyp.—Mr. Fullagar, who has for years kept in his aquarium many specimens of *Hydra vulgaris* and *H. viridis*, communicated a paper on the habits and economy of these creatures, illustrated by numerous drawings (since engraved in 'Science Gossip,' June, 1872). He had, by numberless experiments, proved the accuracy of Trembley's observations on the rapid multiplication of hydras when artificially divided; and he had further observed on the hydras in December whitish tubercles, these containing myriads of animated particles too minute for satisfactory examination by a low objective, though under one of a tenth of an inch focus they presented all the characters of spermatozoa. During their appearance the hydra ceased to take food, and the seminal matter was often squirted forcibly from the tubercle; the parent hydra would then vanish, probably from death and decomposition; and in the following spring some minute hydras would appear in the water, grow freely, and multiply by buds. He gave good descriptions of

their manner of feeding, and of how easily they may be collected and kept to afford very interesting subjects for microscopical inquiry.

April 18*th*, 1872.—*Archegonia and Antheridia.*—Of these, Mr. Down gave some demonstrations in *Polytrichum* and other mosses, showing how easily and instructively the sexual fructification of these plants may be examined even by low microscopic powers, as the examinations were all made extemporaneously, with the assistance of the several microscopes at the meeting, on fresh specimens collected during the afternoon by Col. Horsley and other members.

May 2*nd*, 1872.—*Objects simulating human workmanship found in the Suffolk Crag.*—These were chiefly sharks' teeth, mentioned as belonging to the genera *Otodus* and *Carcharadon*, and having formed part of a series of such objects in the possession of Edward Charlesworth, Esq., F.G.S. Between the fang and crown of each tooth was a hole, like in form and position to that made in such teeth at the present day by the South Sea Islanders, in order to the fabrication of necklaces. The objects were all described as from the Suffolk Crag, and, as they were sent to the meeting by the Rev. W. Bird, without sufficient description or time to prepare any connected account of them, Dr. Mitchinson gave an extemporaneous address on the points at issue. These were the means by which the perforations were made, and their significance however or whenever made; if by man, contemporaneously with the formation of the Suffolk Crag, it would carry his antiquity back most wonderfully. But, admitting the holes to have been the result of human agency, it would then have to be determined when and how the teeth had got into that Crag; and, on the other hand, considering the siliceous teeth of certain mollusks, and the well-known perforations made through very refractory substances by other invertebrates, the precise significance of these perforated sharks' teeth would require more exact inquiry than could be afforded by the meeting.

A Plague of Ticks.—Colonel Cox brought this important question in an initiatory manner before the meeting, as he intended to revert to the subject soon. He and Mr. Dowker described these ticks as arachnids, occurring on sheep and lambs in dense patches as big as a saucer, more scantily on young pheasants, and occasionally on ferrets, but seldom on dogs. The effects on the flocks and on the pheasants were so extensive and dreadful as to strike aghast the bucolic and sporting minds. There were two very different sorts of this tick—one bloated, of a leaden colour, with red legs and occipital plate, and about as big as a small horsebean; the other altogether red, not at all bloated, and scarcely a tenth of the size of the big specimens. Both sizes are found on the sheep and lambs, but the biggest most numerously. The little flat red ticks occur besides very plentifully in pastures, as well as on or under the bark of trees and bushes. Dr. Kersey confirmed these statements from his own observations; and Mr.

Gulliver displayed, by dissections under the microscope, the testes and spermatozoa, and the ovaries and ova, so as to show that all the large bloated ticks were pregnant females, while the males were found exclusively among the small red specimens. The ravages of this tick were described as most destructive at Bifrons, Broom Park, and elsewhere about Canterbury, as well as in other parts of Kent.

Orchis fusca, *Neottia Nidus avis*, *&c.*—Mr. James Reid exhibited fine blooming specimens of these plants, gathered on the 29th of April, and remarked that this was probably an earlier notice of the full bloom of the former orchis than had yet been recorded. He also produced truly wild examples of *Polygonatum officinale* and *Convallaria majalis*, both collected in the neighbourhood of Canterbury.

Water-beetle and Nest.—A female of *Hydrophilus piceus* and her nest, or rather silk-like cocoon of eggs, were shown in one of Mr. Fullagar's vases; and the manner in which this insect forms the cocoon, for the protection of the eggs, was explained by him with the aid of illustrative drawings.

Raphides of Dictyogens.—Mr. Gulliver gave extemporaneous demonstrations of these in fresh plants of *Paris* and *Tamus*, and remarked that in the British flora all the plants of this section are sharply defined by the raphidian character from the immediately preceding and succeeding orders of the so-called natural system; but further observations are required on exotic Dictyogens. He had found raphides abounding in *Lapageria*, *Testudinaria*, *Sarza* and *Dioscorea*, but replaced in *Roxburgia* by crystal prisms ('Quart. Journ. Micr. Sci.,' January, 1866, and July, 1869). Different tubers are sold at Covent Garden as "yams;" these are beautifully distinguishable by the raphides in one kind, which is a *Dioscorea*, from another kind which has no raphides, and is a member of the order Convolvulaceæ. Now, the Yams have been shown to possess, in some important points of structure, a resemblance to the Birthworts; but if we compare the abundance of raphides in *Dioscorea* and *Tamus* with the total absence of these crystals in *Aristolochia*, we shall immediately see a remarkable difference not yet noticed in the books of systematic botany.

May 11*th*, 1872.—*Well-boring at Sturry.*—Colonel Cox read a paper showing that at a depth of from 15 to 19 feet they came to the blue clay, which continued down to 40 feet; and at from 46 to 50 feet a water spring was struck.

The Plague of Ticks.—Colonel Cox, referring to the proceedings on this subject on May 2, read an elaborate paper concerning the Ticks, now so fearfully injurious to the flocks of sheep and the young pheasants of the neighbourhood. By the Rev. H. G. W. Aubrey and the Editors of 'Land and Water,' the Tick was pronounced to be *Ixodes Dugesii*. The Colonel detailed many interesting facts from his own observations, and these were confirmed by the parallel inquiries of Dr. Kersey, Mr. Dowker, and Mr. Gardner; the latter gentleman's flock having suffered

severely from the pest, while he had endured much anxiety and expense in remedial means.

June 6th, 1872.—*Scropularia vernalis, Aceras anthropophora, Lepidium Draba, Statice reticulata*, and *Saxifraga longifolia*.—Mr. James Reid brought fresh plants of the Yellow Figwort, collected in the vicinity of Canterbury, and supposed to be new to the Kentish flora. The Rev. President, Dr. Mitchinson, while casting no doubt on the wildness of the present specimen, remarked that much caution should be used concerning such cases; for, after having himself found this very species abounding near Peterborough, he had learned that a botanist had been in the habit of sowing scarce plants in that neighbourhood. Mr. Reid noticed the unusual abundance of the Green Man-orchis near Canterbury during the present season. The Whitlow Pepperwort was described by Mr. Gulliver as very plentiful in fructification on the West Cliff, at Ramsgate; whereupon Dr. Mitchinson observed, that it would be interesting to note whether it would maintain its existence there, as many strayed or introduced plants, though flourishing for awhile, sooner or later perished, as he had seen remarkably exemplified in the common Virginia Stock and other plants. Specimens of the Matted Thrift, collected by George Gulliver, jun., between Dover and Folkestone, were laid on the table. Dr. Mitchinson, having transplanted a young *Saxifraga longifolia* from its mountain home in Switzerland to a pot in his own garden at Canterbury, found it flourish and bloom admirably, like so many other members of this genus.

Plant Crystals.—Mr. Gulliver, referring to his communication to the Society, September 14th, 1871, gave extemporaneous demonstrations of the sphæraphides of the two British species of *Mercurialis* and of *Viburnum Lantana*, remarking that these are good native plants in which to examine the sphæraphides, and that they may be found abundantly in our indigenous Urticaceæ, Chenopodiaceæ, and many other orders; while the willows, poplars, and many other trees or shrubs, afford plentiful crops of minute crystals of another kind, which are too often incorrectly called raphides. A slide was shown of *Pandanus*, from Professor Thiselton Dyer, in which was well seen chains of cells, each cell containing a prismatic crystal, as discovered by Professor Dyer, the chains surrounding the fibro-vascular bundles. Pandanaceæ is an order long since characterised by raphides; but the crystals now shown in Professor's Dyer's preparation are of a different form, as described and figured by him in the last vol. of the 'Quart. Journ. Micro. Science.'

Notes on Ixodes Dugesii.

Experiments of Dr. Kersey.—This gentleman detailed a series of experiments as to the effect of different reagents in the destruction of these pests, and had not yet arrived at any very satisfactory result. The usual nostrums called "sheep-dips" were all more or less ineffectual. The mercurial liniment of the

Pharmacopœa and Brandish's solution of potass seemed to be most destructive to the parasites; but their tenacity of life is so great and their absorbent powers so little, that they are not easily destroyed by specifics. Mr. Gardner, whose practical experience had unfortunately been so great, concurred with Dr. Kearsey.

Anatomical and Physiological Observations.—These were undertaken, at the request of the meeting, by Mr. Gulliver; and some of the results are noted below, from the examination of numerous specimens supplied by Colonel Cox, Mr. Gardner, Mr. Dowker, and Mr. Bell. All the specimens were eight-legged Acarina, belonging to the family Ixodea, and, as asserted, to the species *Ixodes Dugesii.* No eyes could be detected.

Sexes.—All the large, lead-coloured specimens were pregnant females. Many of the small ones were also females, but these were commonly of a lead colour, and not red, except in the legs and plate at the back of the head. In many ova the large germinal vesicle and its single spot or nucleus was plainly seen. As to the males, they occur abundantly, and sexually mature, among the little red specimens so numerous on pastures and trees or shrubs. The spermatozoa are pale, quite homogeneous, nearly transparent, arcuate, sharp at one end, and blunt or truncate—not clavate—at the other; length 1-185th of an inch, thickness 1-6400th. They disappear when treated with acetic acid, and cannot be made to dry well; in both these respects, as well as in others, differing from the spermatozoa of insects and mammals. The testis is a bunch of vesicles much like the ovary.

Eggs.—Some of the large females, after a few days' confinement in a tin box, deposited there many ova, feebly sticking together in clumps often as large as the parent ticks. These eggs were smooth, of a glistening chocolate colour, oval in shape, and each about 1-40th of an inch long and 1-60th broad. Their shell was composed of chitine; its contents chiefly of corpuscles, some globular, more of the same form as the shell, and presenting an average length of 1-500th and a breadth of 1-727th of an inch; each distinct in outline, and all generally larger and more regular in size than common yolk granules. The number of ova was so great as to show the prodigious fecundity of these ticks, as, indeed, is too well known to the flockmasters of this neighbourhood.

Urinary Apparatus.—This is greatly developed, consisting of two transparent tubes, easily recognisable by their opaque white contents, having all the properties of guanine, and never showing any trace of uric acid. In the more common sheep-tick, which belongs to the hexapod insect-order Diptera, and is the *Melophila ovina* of Nitzsch, and which was examined at the same time for comparison, uric acid was always found. Thus these two creatures, both living on the selfsame sheep, have their urinary matter so essentially different. And in the excrement of every insect and spider examined the same difference was found, corresponding to the observations made on scorpions and true spiders many years since by that eminent physiologist

John Davy. And this important physiological character, now extended to the Acarina, though not yet recognised in the books of the zoological taxonomy, should fine a place there. The same holds good of *Argas* (described as British in the 'Quart. Journ. Micro. Sci.,' April, 1872), in which species the urinary granules are opaque, white, smooth, shining, concentrically striated, more or less globular or oval, with an average diameter of $\frac{1}{1200}$th of an inch, and often two partly fused together. They present a truly beautiful microscopic spectacle, especially when examined in clusters within the urinary tubes. In *Ixodes* the urinary granules are not so large and remarkable as in *Argas*. The urinary tubes in both commence by a blind and sub-clavate extremity at the fore part of the body, and proceed tortuously backwards to open into the last portion of the intestine, where is a bilobed sac,—a sort of urinary bladder, most distinct in *Argas*.

Feet and Progression against Gravity.—The smaller specimens of these ticks may be often seen crawling, like flies and some other insects, up and under the sides of polished surfaces. This is done by means of the caruncles, one of which is situated between each of the pair of hooked and terminal claws, on their concave side. When the creature has the claws free, each caruncle presents a crescentic shape, but the moment it is applied to the glass or other smooth surface the caruncles become adapted to it, and assume the form of round flattened disks. All this may be well seen with the half-inch objective, when the *Ixodes* is walking on the glass object-slide, by an examination of the action on both sides, *i.e.* either from the ventral or dorsal aspect of the animal. As no mark of viscid matter is then perceptible, it is probable that atmospheric pressure produces the effect. *Argas* is devoid of such pedal structure.

Queen-bee Jelly.—The eminent apiarian Major Munn, having sent specimens of queen-bee cells, with their contained larvæ and jelly (or "bee bread"), from four to eight days old, Mr. Gulliver undertook to examine it. The colour of the jelly was whitish, its consistence pulpy, its taste somewhat sharp and sweetish. It reddened litmus; was miscible with water, and assumed an opaque white colour with alcohol, sublimate, nitric acid, and heat. Acetic acid produced no effect, but caustic potass very quickly and completely dissolved it, and the solution was instantly precipitated on the addition of acetic acid. There was no trace of gelatine in the jelly; it soon dried into an amber-like solid, but became white and pulpy, as it was originally, when soaked in water. Morphologically, the jelly was partly composed of a very fine molecular base, like that of mammalian chyle, the molecules much alike in size and form, and measuring each about 1-30,000th of an inch in diameter; but the molecules, being completely insoluble in alcohol or ether, differ from those of chyle.

It is not a little remarkable that this queen-bee jelly, though undoubtedly of very high importance in the economy of this most useful insect, is not even mentioned, much less described, in the

great books of animal, organic, or physiological chemistry. When noticed in other works, it is but perfunctorily, and in a manner to indicate a collection from pollen or other parts of plants ; and it was seen by Mr. Gulliver to contain a few pollen-grains, some almost perfect, others disintegrated, but altogether insufficient to form the essential composition.

But, now, this is plainly proved to be one of the albuminoid group, affording an abundance of Mulder's protein, highly nitrogenized, and with a molecular base, the whole evidently a true animal secretion and by no means a mere collection. And thus the queen-bee jelly is exactly such a nutrient matter as may be rationally supposed most conducive to the growth and development of the larva, just as milk is to young mammals, and the ingluvial secretion of certain birds to their nestlings.

East Kent Natural History Society.

President, the Rev. John Mitchinson, D.C.L., &c., Oxon.; Honorary Secretary, George Gulliver, F.R.S., &c.

July 4th, 1872.—*Food of Naïdina.*—Colonel Horsley exhibited some small and lively species of naïd worms, from a freshwater pool in the neighbourhood. They were seen under the microscope feeding greedily on *Volvox globator*, and numbers of this minute plant then appeared inside and distinctly through the transparent bodies of the animals.

New Fossil Fish.—Mr. James Reid laid on the table and gave a short and very interesting account of a fossil fish which he had obtained two or three years ago from the Gault, near Folkstone. Dr. Günther, having examined the specimen, stated that it is quite new, and belongs to the Clupeoidei, and he has named it *Thrissopater Salmoneus;* a very valuable addition to our fossil fauna.

Ammocœtes branchialis.—Mr. George Gulliver (of Pembroke College, Oxford) showed under the microscope sections of this larval fish, made by hardening in chromic acid and staining with carmine. Though the eyes do not appear externally, perfect eyes and their chambers and crystalline lens were seen in the sections; the auditory sac and its coarsely ciliated epithelium were shown, as were also the ovaries, well developed in this immature fish, with numerous ova presenting the germinal vesicle and spot; and the infolding of the inner coats of the gut, like an intestine within an intestine, was well displayed. All these points are easily seen under the microscope by this method of preparation.

Eggs of Argas reflexus and Ixodes Dugesii.—Some females of these Acarina having been confined in boxes kept in Mr. Gulliver's library, and at Mr. Fullagar's, during May and June, continued lively without food up to the beginning of July, about which time they were found to have laid many eggs. Of *Argas* these were spherical, generally about $\frac{1}{34}$th of an inch in diameter, of a dull grayish colour, and slightly rough on the surface; a few of them were of a suboval shape. Thus, these eggs differ from those of *Ixodes Dugesii* in size and shape, for of this last species the eggs are regularly oval, about $\frac{1}{40}$th of an inch long and $\frac{1}{60}$th broad, very smooth and of a shining chocolate colour; in both species the egg-shells are composed of chitine.

July 18th, 1872.—*Excursion.*—This took place in the neighbourhood, and the party was hospitably entertained by the Vice-President of the Society, Colonel Horsley, at his residence, St. Stephen's Lodge, near Canterbury.

Raphides of Onagraceæ.—The botanical specimens brought in from the excursion, with several other contributions by Mrs. Dean, were the following:—Epilobium parviflorum, Torilis anthriscus, Lathyrus pratensis, Scrophularia aquatica, Ranunculus sceleratus, Eryngium maritimum, Hyoscyamus niger, Salsola kali, Trifolium

fragiferum, Lactuca saligna, Artemesia maritima, Cynoglossum officinale, Carex vulpina, and Poa pratensis. This miscellaneous and random collection affording a good opportunity for trials of the value of the raphidian character, these were carefully made. The result was that in no plant were any raphides found except in the *Epilobium*, in which they were, as they regularly are in the order to which it belongs, very plain and abundant. And thus in our flora the diagnosis was maintained, as formerly shown, of Onagraceæ—*Calycifloral exogens abounding in raphides.* Yet this short diagnosis, so easily demonstrable and eminently natural, has not yet found its place in our books of systematic botany.

Auditory Capsule of Mollusca.—In the little bivalve *Cyclas cornea*, so common in our ditches, the auditory vesicle and its vibrating otolith are so very beautiful and easily found that it must become a favorite microscopic object. Mr. Fullagar, after two or three trials, by tearing asunder with needles portions near the base of the creature's foot, succeeded perfectly in showing the vesicle and its oscillating otolith, much to the admiration of the meeting. Figures of the auditory vesicles of several molluscs are given in the 'Journal of Anatomy,' vol. iv.

August 1st, 1872.—*Skeleton of Lumna cornubica.*—The Hon. Sec. gave a detailed account of the preparation and completion of this remarkable skeleton at the College of Surgeons, of which full reports have appeared in the 'Kentish Gazette,' August 6th, 'Land and Water,' August 17th, 1872, and several other periodicals. The skeleton is seven feet nine inches in length, and, owing to the judicious preparation, has lost only four inches in drying. There are no ribs. The vertebræ number 152, of which sixty belong to the tail, and these last turn upwards along the superior border of the caudal fin, while in some other Selachians, as *Scyllium*, the caudal vertebræ end in a straight line with the trunk. The claspers are bony, each composed of three pieces, the terminal piece being a curious spine, as if for intromission.

Progression of Arachnids in opposition to gravity.—Referring to observations at the meeting of July 6th, the walking of Ixodes on the under and polished side of glass was shown to be due to the effect of atmospheric pressure on the elastic pedal caruncles of the creature, and that this is also the case with the great Tiger Spider of Ceylon had been clearly proved by Dr. Davy, in his 'Physiological Researches,' p. 336, 8vo, Lond., 1863.

August 15th, 1872.—*Ichneumonidæ.*—Mr. Fullagar exhibited living specimens from his vivarium of these hymenopterous insects, hatched out of the chrysalis of the Red Admiral butterfly, and read a paper on their habits and economy.

Palate of the Cyprinoids.—This soft structure, so well known in the Carps, has commonly been regarded as a gland analogous to the pancreas. Mr. George Gulliver, having made preparations of this so-called palate, by hardening it in chromic acid and then staining fine sections with carmine, exhibited them under the microscope at the meeting. The tissue of the part presented a large propor-

tion of transversely striped muscular fibres; and the mucous surface was beset by large papillæ, so as to present rather the character of a tactile organ than of a gland.

Neuronaia Lampetræ.—Referring to the notices in the 'Proceedings of the Zoological Society,' Dec. 6th, 1870, and 'Quart. Journ. Mic. Science,' Jan., 1872, concerning this entozoon, preserved specimens were shown under the microscope to be entirely devoid of the spines near the mouth and on the surface of the body which characterise the allied *Neuronaia Monroii* of Goodsir. When magnified, *Neuronaia Lampetræ* somewhat resembles Yarrell's figures, of the natural size, of *Tristoma coccineum*, which occurs on the skin and branchiæ of the sun-fish.

Eggs and newly hatched Broods of Ixodes Dugesii and Argas reflexus.—Referring to the description of these eggs at the meeting on the 4th July, Mr. George Gulliver now exhibited the newly hatched young of both these species. Swarms of the young broods were found on the 1st of August free from the eggs (the hatching continued up to the last day of observation, on the 15th) and running actively about, trying to escape from their prisons. These young of the two species were miniatures of their parents; only, as already known of some other immature Acarina, they had six legs, and these so crowded that no room appears, before a moult, for the wanting fourth pair, except posteriorly. Besides, in Argas the body of the young was fringed, especially at its hind part, with hyaline hairs; and these little creatures are so transparent that the urinary sacs near the anus were seen to be filled with the granules of guanine described at the meeting on June 6th, 1872, and reported in the 'Quart. Journ. Mic. Science' of the following month. Thus, the dart-like mandibles, with recurved teeth and the articulated palps, were much produced in the young of both species, especially of Argas. *Ixodes* is so very prolific that one female confined in a pill-box laid no less than 143 eggs, all of which, except six, were hatched. Having thus discovered the time and manner of breeding, and how easily these creatures may be bred for observation in confinement, we may already perceive some practical applications. Thus, the usual attempts of flockmasters to relieve their suffering sheep by picking off the parasites and throwing them on the ground is simply sowing the vermin broadcast, for all these bloated *Ixodes* are pregnant females, ready to lay their eggs to be hatched spontaneously. The ravages of this arachnid on sheep and pheasants have been dreadful this season in the neighbourhood of Canterbury.

September 5th, 1872.—*Excursion to Whitstable.*—Colonel Horsley, Mr. Sibert Saunders, and Mr. Fullagar, collected several Campanularidæ, Tubularidæ, Annelida, and Ascidiæ, and exhibited them in different marine aquariums, giving at the same time very instructive demonstrations of the various living animals under the microscope. Mr. Sheppard and Mr. Fullagar exhibited and illustrated the habits and economy of Pagurus in living specimens. Mrs. Dean collected and named numerous phænogamous plants, among which was Hippophaë rhamnoides; and Mrs. Fairbrass

arranged a bouquet of wild flowers so as to prove how effectively they may be used for graceful decoration.

September 19th, 1872.—*Blood-disks of Gadidæ.*—The meeting was chiefly occupied in the examination of plants lately collected near Canterbury by Mrs. Dean; in microscopic demonstrations of the wings of Ephemerinæ and diurnal Lepidoptera by Colonel Horsley and Mr. Fullagar; and in the determination of some species of fishes collected a few days since at Hastings by Mr. George Gulliver. Of the fishes, it was shown that the red blood-corpuscles of the little *Motella* are as large as those of other and big members of the Gadidæ; and thus that the relation of size between the species and its blood-disks, long since proved by the Hon. Sec. in mammals and birds, is not maintained in fishes, nor is it in reptiles; and the facts are of much physiological significance.

East Kent Natural History Society.

President.—The Reverend John Mitchinson, D.C.L., &c., Oxon.;

Honorary Secretary.—George Gulliver, F.R.S., &c.

October 3rd, 1872.

Garnet Sand.—Colonel Horsley exhibited specimens of this sand, which he had collected at Cape Comorin, the extreme southern point of the continent of India. The characteristic colour of the garnet was very fine, and so brilliant under the microscope as to appear like an effect of polarized light.

Raphides of Tamus and Epilobium.—He also displayed these plant-crystals, which had been the subject of observation at the meetings of May 2nd and July 18th, when they were shown to be so characteristic of indigenous Dictyogens and Onagraceæ that these orders or groups are most easily distinguished from their next allies of other orders.

Parasites and Nettle-cells of Polyps.—These were shown in *Hydra vulgaris* by Mr. Fullagar. The parasites were seen, under the microscope, to move rapidly within narrow limits by means of the vibratile cilia with which their bodies are covered like *Paramecium*. Slides of dried nettle-cells and threads of the polyps proved how well they may be thus prepared as interesting objects for the microscope.

The Hop-dog.—Mr. Frank Wacher brought to the meeting living specimens of this larva, when the hairs thereof were microscopically examined. They proved to be very delicate and translucent, many somewhat plumose, others composed of parallel cells, projecting in teeth directed towards the pointed and free end of the hair; thus the hairs of this caterpillar are not club-shaped at the tips, as they are generally described to be in the "woolly bears." It was noted as singular, in the present activity of research concerning the Lepidoptera and other insects, that we have not yet any sufficiently exact and extended observations on the comparative characters of the hairs of caterpillars, since, independently of their intrinsic beauty as microscopic objects, they would probably afford useful diagnostics in classification. The "hop-dog" is the caterpillar of a nocturnal moth, *Dasychira pudibunda*, belonging to the family Arctiidæ.

Evils and Benefits of Insects.—A discussion ensued on the evils and benefits of insects. Among the numerous hairy cater-

pillars which feed on the leaves and other parts of plants is the hop-dog; and the devastation of such insects is too well known. For example, in the year 1782 such were the ravages of *Porthesia auriflora* that prayers were ordered to be read in our churches to arrest its devastations, as related by Mr. Curtis in his 'Short History of the Brown-tail Moth,' published during that disastrous year; and our agricultural annals abound in similar accounts. But while we lament the manifold injuries inflicted by insects, we should not be unmindful of their benefits. Thus to insects we owe honey, wax, and silk, some valuable medicines, abundant food for birds and many other animals, and even for man—"his meat was locusts and wild honey;" the conversion of vegetable matter into nitrogenous compounds for manure; and, above all, the fertilisation of countless plants. In short, though the damages done by insects may be part of the primeval curse, in our present state these creatures are so essential to our welfare that, were they all completely swept from the face of the earth, there would be more lamentation for their absence than has ever been caused by their presence; and, indeed, without the beneficent agency of insects it is probable that numberless plants and animals, including the human race, would fade from the face of our planet.

Stenopterix hirundinis.—This parasite, though commonly described as infesting the swift, occurs frequently at Canterbury on the swallow. The Rev. C. W. Bewsher submitted to the meeting specimens from the swallow. They belong to the Pupiparæ, a family of dipterous insects, which, however insignificant singly, are very formidable when occurring in numbers. Thus, the *Hippobosca equina*, though scarcely larger than a small house-fly, has prevented the assembly or operations of armies; even lately intended reviews and bivouacs of cavalry in one of our forests were said to have been defeated by the mere demonstrations of these insects.

On examination under the microscope the compound eyes of *Stenopterix hirundinis* were found to be large, with the hexagonal facets of proportionable size—a structure of which the function in a creature passing its life buried among the roots of the bird's feathers is not very obvious. The pigment behind the corneal facets was red. The transverse striæ of the muscular fibres of the legs were large and distinct, and sometimes presented an approach to a spiral form, recalling the more evident appearance thereof in a mounted specimen which is in the possession of the eminent zoologist, Dr. Bowerbank, and which was prepared from an amputated human limb. The magnitude of these transverse markings is noteworthy, because it has been regarded by Leydig and others as related to the activity of the muscles. But the legs of *Stenopterix* are not remarkable for activity; and the Hon. Secretary had long since proved of its host, the swift, that the transverse striæ of the wonderfully active pectoral muscles are much finer or smaller than the corresponding striæ of the comparatively idle crural muscles of the same bird. Indeed, the different cha-

racters of these muscular striæ is a subject deserving of further research throughout the different subdivisions of the Arthropoda and of the vertebrate subkingdom; and this would be an addition to the objects for a rational employment of the microscope.

November 7th, 1872.

Habits and Economy of the Fresh-water Polyps.—Mr. Fullagar, who has devoted much attention to these creatures in his aquarium, read a paper on the subject, illustrated by the living specimens and numerous instructive drawings. As it is understood that these will be engraved, and published with the whole text, in 'Science Gossip,' the present abstract will be very brief. The spermatozoa of *Hydra vulgaris* were discharged in the autumn, as noticed by previous observers; but *Hydra viridis* discharged its spermatozoa in the summer, in one instance as early as the first day of June; and in this species the sperm-cells and germ-cells were in the same individual. The development of the bud of germ-cells took three days from its first appearance, on the lower part of the body, until its separation therefrom and sinking to the bottom of the vase of water. In about fifteen days thereafter the germs or ova were hatched in the form of minute microscopic creatures, slowly growing, until the tentacles appeared, one or two at first, and gradually increasing in number and size, four only very short ones appearing at an early period of the development. The author repeated his observations, made at the meeting of Oct. 3rd, on the nettle-cells and parasites of the Hydra, and further illustrated them by drawings.

November 21st, 1872.

English Anchovies.—Mr. Gulliver gave an account of the distinctive characters of *Engraulis encrasichlus*, illustrated by specimens which he had lately procured during a visit to the coast of South Devonshire, and with the hope that some of the members of the society might be induced to look for this fish on the Kentish and Sussex coasts. At Dawlish, Teignmouth, Torquay, and the neighbouring fisheries, he had seen it so plentifully as to raise the question, why should we not catch and cure our own anchovies? To the well-known characters by which the anchovy is distinguished from the sprat, he added that in the former the maxillary teeth are much larger than in the latter. And while explaining that these teeth, though characteristic of our Salmonacei and Clupeidæ, are neither described nor depicted in some of our great works of ichthyology, he added that this remarkable feature is commonly ignored by our best artists; as more fully explained in the lecture on the Smelt, at the meeting of the society on January 18th, 1872. The teeth of the anchovy are pretty objects under the microscope, and by them this fish may be easily distinguished, even in bits of the maxillary, from the sprat.

December 5th, 1872.

Blood-disks of Salmonidæ.—The Hon. Sec. having been afforded, by the courtesy of Mr. Frank Buckland, an opportunity of examining some of the living specimens in the museum of economic pisciculture, at South Kensington, exhibited slides of the red blood-corpuscles of *Salmo fontinalis* and *Salmo ferox*, and compared them with the corresponding corpuscles of other species of the same family of fishes and with several more osseous fishes of distinct orders. The results, in conformity with those described and depicted in Mr. Gulliver's memoir, read at the Zoological Society, November 19th, 1872, showed the pre-eminent largeness among osseous fishes, so far as is yet known, of the blood-disks of the Salmonidæ; while those of *Salmo fontinalis*, having a mean length of $\frac{1}{1455}$th and breadth of $\frac{1}{2286}$th of an inch, are the largest at present measured of this family. Hence it may be concluded that it is characterised among the osseous orders by the large size of its blood-disks; but in the Smelt (*Osmerus eperlanus*) this character is not maintained.

Sphæraphides of Caryophyllaceæ.—Mrs. Dean presented specimens of *Silene maritima*, of which the intimate structure was examined at the meeting, when the tissue of the leaves and stalks was found to be studded with sphæraphides, very variable in size, but having a mean diameter of about $\frac{1}{1333}$rd of an inch. This is an admirable British example of these bodies, and really a beautiful microscopic object. These sphæraphides, which are common in Caryophyllaceæ, were well shown in the Deptford Pink (*Dianthus armeria*), at the meeting of the society on August 3rd, 1871, reported in the 'Quarterly Journal of Microscopical Science,' January, 1872.

EAST KENT NATURAL HISTORY SOCIETY.

TITLE & OBJECTS OF THE SOCIETY.

The objects of the EAST KENT NATURAL HISTORY SOCIETY shall be the Collection and Diffusion of Practical and Theoretical Knowledge respecting Natural History, in all its Branches, both in relation to the particular District and the General Science.

RULES AND REGULATIONS.

MEMBERSHIP.

1. The Society shall consist of Ordinary, Honorary, and Corresponding Members, and of Associates.

2. Every candidate for admission into the Society as an Ordinary Member, must be proposed in writing by two Members, and the election shall be by show of hands or by ballot, taken at any meeting of the Committee, or at a General Meeting—one negative in five votes to exclude.

3. The Annual Subscriptions to be paid by Ordinary Members shall be Ten Shillings; the Subscriptions shall become due on the 1st of January in each year, and shall be paid in advance for the current year. Any Member neglecting to pay his Subscription for three months after it is due, shall be applied to by the Treasurer or Secretary, and if the Subscription remain unpaid for three months after such application, he shall cease to be a Member of the Society.

4. The Committee shall have power to admit, without ballot, on the nomination of two Members, any Lady who shall be desirous of becoming an Ordinary Member, and her Subscription shall be Five Shillings. This ule shall apply also to such sons, brothers, and nephews of Ordinary

Members, as may be regularly resident in the same house with those Members.

5. Any persons distinguished for their researches in Natural History, for their liberality to the Society, or for their connection with similar Societies, may, on the recommendation of the Committee, be elected Honorary or Corresponding Members of this Society, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subjected to any of the expenses of the Society, and shall have no vote in its affairs, nor be entitled to take books out of the Library, nor to the Reports and Notices.

6. In order to encourage the study of Natural History among individuals of the class of Mechanics, &c., residing in the district, the Committee shall have power to admit individuals of that class as Associates, provided they shall first communicate some information or observation on Natural History, exhibit such specimens or present them to the Local Museums, as shall by their merits satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

MANAGEMENT, AND BUSINESS MEETINGS.

7. The affairs of the Society shall be conducted by a Committee of Management, which shall consist of a President, Vice-Presidents, a Treasurer, and an Honorary Secretary, and not less than six Members, who shall all be chosen at the Annual Meeting. Three Members of such Committee shall form a quorum. The Meetings shall be held at four o'clock p.m. on the first Saturday of every month, and at such other times as the Secretary may deem necessary. At any regular Meeting including a sufficient number of Committee-Members, they may then and there declare themselves and act as a Committee in the ordinary business of the Society.

8. An Annual Meeting shall be held, at four o'clock p.m., on the last Tuesday in January, in each year, at Canterbury, for the purpose of electing the Officers for the current year, receiving the Annual Statement of Accounts, and Report of the Committee, and conducting the general affairs of the Society. In case of necessity, the Committee may alter the hour, posting due notice thereof in the Society's room.

9. Special General Meetings may be summoned by the Committee, or by the Secretary, on the requisition (in writing) of any six Members of the Society, the specific purposes of the Meeiing being stated in the notice, which shall be sent to each Member not less than one week before the time of such Meeting.

10. All questions discussed at the Meetings shall be decided by a majority of votes; and if upon any question the votes shall be equal, the Chairman of the Meeting shall have the second or casting vote.

11. In the event of any vacancy occurring in the Officers or Committee, between the Annual Meetings, the same shall be filled up by the Committee. The two Members who have been longest thereon, and have attended the fewest meetings thereof, during the preceding year, shall go out by rotation at the Annual Meeting.

12. In order to facilitate the objects of the Society, the Committee shall be empowered to appoint any member a Local Secretary for the town or district he may reside in. Such Local Secretary shall be *ex-officio* a Member of the Committee.

SCIENTIFIC MEETINGS AND EXCURSIONS.

13. The Meetings for Scientific Business shall be at seven o'clock p.m., on the first Thursday of every month at Canterbury; also extra Meetings at such place and time as the Committee shall have posted due notice of in the Society's apartment. Each Member to have the right of introducing a Visitor at these Meetings.

14. There shall be ordinary Excursions on the Afternoon of the day of each Evening Scientific Meeting, and at other times if the Committee so appoint, time and place to be duly notified in the Society's room by the Committee; and Special Excursions at such times and places as may be approved by the Committee, who shall consider written suggestions of Members on the subject.

15. Minutes of the Proceedings of all Meetings shall be entered by the Secretary in a Book kept for that purpose.

16. The Secretary to give seven days' notice of Special Excursions to every Member, stating the time and place thereof, &c.

LOCAL OR DISTRICT MEETINGS.

17. To promote still further the objects and interests of the Society Local Secretaries and Members are invited to organize Meetings or Excursions in their district; and to give notice of the same to the General and all the Local Secretaries; stating the time and place of Meeting, and what particular subjects are to be brought forward.

COLLECTION OF SPECIMENS.

18. The Society, as soon as it may possess sufficient means, shall

endeavour to make a Collection of Objects of Natural History, both with a view of forming a Museum and distribution of Duplicate Specimens according to the Regulations to be adopted by the Committee.

LIBRARY.

19. Only Books and Periodicals connected with Natural History are to be purchased by the funds of the Society, and the number and particular books of this class to be purchased shall be determined by the Committee.

20. All the Books and Periodicals shall be kept in some convenient place, so that Members may be able to refer to them, or take them out, under such regulations as the Committee from time to time may think proper to make.

21. Members are also invited to lend Books for the use of the Library, reserving to themselves the full right of ownership; such Books to be under the care of the Committee, and not allowed to be taken out of the Library.

22. In order to allow the Librarian to examine the Books, they must all be returned to the Library and none taken therefrom during the first week in every June.

East Kent Natural History Society.

MEETINGS, 1873-74.

SCIENTIFIC, on THURSDAYS, at 7 o'clock p.m.

March	6, 1873.	October	2, 1873.
April	3, „	November	6, „
May	1, „	December	4, „
June	5, „	January	1, 1874
July	3, „	February	5, „
August	7, „	March	5, „
September	4, „	April	2, „

COMMITTEE, on SATURDAYS, at 4 o'clock p.m.

February	1, 1873.	September	6, 1873.
March	1, „	October	4, „
April	5, „	November	1, „
May	3, „	December	6, „
June	7, „	January	3, 1874.
July	5, „	February	7, „
August	2, „	March	7, „

ANNUAL MEETING,

TUESDAY, JANUARY 27, 1874, at 4 o'clock p.m.

SIXTEENTH REPORT

1873

OF THE

EAST KENT NATURAL HISTORY SOCIETY,

ADOPTED AT THE

ANNUAL MEETING,

HELD ON JANUARY 27th, 1874.

CANTERBURY:

PRINTED AT THE "KENTISH GAZETTE" OFFICE, HIGH-STREET.

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CONTENTS.

EAST KENT NATURAL HISTORY SOCIETY.

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REPORT OF THE COMMITTEE FOR THE YEAR 1873.

Your Committee is happy to report that the Society is prospering, and maintains its interest and usefulness. It numbered 99 members at the close of the year 1872, and 97 at the end of the year 1873; showing a loss of two members by death, three by removal, and a gain of three new members. At the former period the balance in the hands of the Treasurer was £12 12s. 3d., and at the latter period £4 10s. 3d.

The Society having, at the last annual meeting, voted an extra sum of £5 for the purchase of additional books, the Library has been increased accordingly, and it is hoped in a manner conducive to the best interests of the members. As usual, the new books have been carefully selected, with a view to their utility as works of reference, and to their cost. On those points the Committee has acted to the best of its judgment, with the assistance of the Honorary Librarian and the Honorary Secretary, and it is hoped with satisfaction to the Society generally; at all events the Committee is and has always been ready to consider any suggestion from any member as to the addition of books to the library; for this department is surely most important, seeing that there is no other collection of books on natural science available in or near the City of Canterbury, and that such works are quite essential to the cultivation of this branch of knowledge. The books and pamphlets added to the library during the year just expired are specified in the Librarian's Report.

The microscope, purchased in accordance with a resolution at the last annual meeting, has proved a source of pleasure and profit, both at the scientific meetings, and at other times in the library, where this instrument stands ready for the use of the members, subject to such care as the Committee may deem necessary. And some of the members, such as Colonel Horsley, Mr. Sidney Harvey, and Mr. Fullagar, have very often brought their instruments, and thus rendered valuable assistance to the business of the scientific meetings; other members, as Colonel Cox, Mr. Sibert Saunders, and Mr. Bell, have given occasional aid in the same manner; and for all these acceptable services the thanks of the Society are due. Your Committee cannot avoid deploring, in common with the whole Society, the loss by death of the late Major Augustus Munn, who was so long a most valuable and active member of the Society, the scientific proceedings of which were so often enriched by his interesting and important observations on the structure and economy of the honey-bee.

The reports of the scientific meetings having regularly appeared

in the *Kentish Gazette*, and with a fulness and accuracy which reflects much credit on the conduct of that newspaper, will have kept the members of the Society well informed of the proceedings at those meetings. Abstracts of the same reports have been published from time to time in the *Quarterly Journal of Microscopical Science*, and these it is proposed to reprint with the rest of the annual report for circulation among the members. But this will cause a little delay, as the manuscript of the reports for the last quarter is still in the hands of the editors of that journal, and will not be printed before the 1st of April, immediately after which the report for the whole year will be made up and issued to the members. Even this little irregularity would have been avoided, but for the absence of the Honorary Secretary, who is detained by indisposition at Hastings, and is scarcely at present able to undertake the compilation again.

The results of the scientific business, being thus published, may be left without comment, save that some of them have been deemed worthy of further publication and have accordingly appeared in several of the scientific journals of the metropolis. The excursions have been very useful in providing materials for the scientific meetings; and for assistance at those pleasant trips the thanks of the Society are due to Mrs. Dean, Colonel Horsley, Mr. Sibert Saunders, and last, but not least, to the excellent Hon. Assistant Secretary, Mr. Fullagar.

But this is by no means the only use of such excursions. They help to introduce the young to, and confirm the old in, the practice of out-door natural history; and when the taste has been thus directed and cultivated it is sure to lead to a further knowledge of the subject. Nor can it be prosecuted judiciously without its due reward, of enabling the mind to see the Creator in the creation, and to realize an ample fund of innocent amusement and instruction, quite independently of the hoarse disputes of less valuable though too often more engrossing matters. And, indeed, your Committee is impressed with the feeling that the provision of the means of rational enjoyment accordingly is not the least service afforded by the Society; and hopes that this consideration, involving as it does the intellectual culture of the rising generation, will insure the countenance and support of many persons who, having little taste for natural science, may yet feel much interest in the cause of an important branch of education. And, in support of the truthfulness of this view, it is noteworthy that it has been at length fully recognised, and substantially entertained, in our great universities, and in some of our public and other schools.

The promotion of the Rev. Dr. Mitchinson to the See of Barbados has left vacant the presidential chair, which he filled with so much advantage to the Society. Hence it becomes the duty of the members to elect a successor to him. And the Committee, having obtained the consent of the Very Reverend the Dean of Canterbury, proposes him for president during the next year. Having thus lost Dr. Mitchinson, your Committee considers that the warmest thanks of the Society are due to him for the very able and kind manner in which he undertook and discharged the duties of president; and surely the most cordial wishes of all the members will be for the health and prosperity of the Prelate in his new sphere. And your Committee hopes to be favoured from time to time with communica-

tions on subjects of interest to naturalists from the Bishop of Barbados, as a corresponding member of the Society.

The evening meetings for scientific business were always held on the first Wednesday of every month, until Dr. Mitchinson suggested that Thursday would be a more convenient day to him. But this reason no longer remaining, the Committee proposes that these meetings should be again held on Wednesdays. In that case it will only be required to make the needful alterations in the card of the meetings.

As already noticed, the scientific proceedings of the Society are now regularly published, sometimes affording additions to one or other branch of natural science, sometimes to a more particular knowledge of the natural productions of the East Kent district; and always, it is hoped, with the effect of exciting a further spirit of rational inquiry concerning subjects of great importance, which will surely in future form part and parcel of a liberal education. But while affirming this point, which is still a vexed question in some highly respectable quarters, your Committee would not be understood to maintain that the often theoretical and speculative, and constantly changing and progressive, science of natural history, can ever advantageously supplant, in the service of education, those exact sciences and fixed languages which have so long and successfully maintained their ground in our schools. Thus far your Committee, on the part of the Society, would avoid the too common error of overrating the value of natural science; since its inherent interest and importance, and its great usefulness in training the mind to observation and reflection on the works which nature has so bountifully provided for our amusement and instruction, are indisputable facts sufficiently obvious to prove and proclaim the true merits of such studies.

In conclusion, your Committee suggests that the warmest thanks of the Society should be given to all its officers for the very careful and efficient manner in which they have discharged their respective duties.

The Committee's report having been adopted and ordered to be printed, the meeting unanimously and cordially elected the Very Rev. the Dean of Canterbury to the office of President for the ensuing year, and the Right Rev. the Bishop of Barbados to be a corresponding member of the Society. In like manner the thanks of the Society were voted to all its officers, and they were re-elected to their respective posts. A sum of £15 was voted for additions to the library during the ensuing year, and of £5 for further microscopic apparatus.

REPORT OF THE LIBRARIAN FOR THE YEAR 1873.

The amount at the disposal of the Librarian during the year 1873, granted from the general fund of the Society, was £15, less 6s. 5d. spent in excess in 1872, and repaid to the Treasurer—leaving £14 13s. 7d.

Of this sum £9 15s. 5d. was spent in the purchase of new books, &c., a list of which is given below, and £4 15s. 5d. for periodicals, leaving a balance of 2s. 9d. in hand.

The New Works consist of the following, viz. :—

1. Loudon Encyclopœdia of Plants, with 2 supplements.
2. Kirby and Spence's Introduction to Entomology, 4 vols.
3. Allman's Freshwater Polyzoa, } Bound in one vol.
4. Burmeister's Trilobites, }
5. Treasury of Botany, 2 vols., by Lindley and Moore.
6. Darwin's Cirripedia, Ray Society, vols. I. & II.
7. Williamson's Recent Foraminifera, Ray Society, 1 vol.
8. Leighton's Lichen Flora, British, 1 vol.
9. Henfrey's Elementary Botany, 2nd Edition, by Dr. Masters, F.R.S.
10. Clarke's Common Sea Weeds.
11. Reports on Zoology for 1843 and 1844, Ray Society.
12. Bates' Phasmidæ, (Pamphlet.)
13. Lubbock's Chlœone, (Ditto.)
14. Micrographic Dictionary, parts X, XI, XII, new Edition.

In return for the one guinea subscription annually to the Ray Society the undermentioned work has been received and added to the Library, viz. :—

Monograph of the Collembola and Thysanura, by Sir John Lubbock, Bart.

The following Book and Pamphlets, &c., were presented to the Society during the year 1873, viz. :—

1. Portlock's Geological Report on Londonderry, and part of Tyrone and Fermanagh, by W. Whitaker, Esq., Geological Museum, Jermyn Street.
2. Proceedings of the Eastbourne Natural History Society for portions of 1872 and 1873.
3. A Paper on the Œsophagus of Red Hornbill, from G. Gulliver, Esq., F.R.S.
4. Seven Pamphlets on various subjects, from the Secretary, C. Holst, of the Royal University of Christiana.
5. Book on Preparing and Mounting Microscopic Objects, by Mr. Fullagar.
6. Pamphlet on the Size of the Red Corpuscles of the Blood of the Salamander, &c., by the author, G. Gulliver, Esq., F.R.S.
7. Report of the West Kent Natural History Society for 1872.
8. List of Works on the Geology, Mineralogy, and Palæontology of the Hampshire Basin, from the author, W. Whitaker, Esq.
9. Paper on the Apiary, from the late Major Munn.
10. Pamphlet on the Crystals in the Testa of the Elm, and the Character of the Epidermis of the Tway-Blade, by the author, G. Gulliver, Esq., F.R.S.
11. Pamphlet on the Measurement of the Red Corpuscles of the Blood of Batrachians, by the author, G. Gulliver, Esq., F.R.S.
12. A Paper from Eastbourne Natural History Society, on a New Fungus, by C. T. Muller, Esq.

FINANCIAL STATEMENT FOR 1873.

RECEIPTS.

	£	s.	d.
Balance in hand, 31st December, 1872	12	12	3
Subscriptions received in 1873, including Dover Branch to this date for 1873, and arrears	36	5	6
	£48	17	9

Examined and found correct, January 26th, 1874.
GEORGE RIGDEN.

EXPENSES.

	£	s.	d.
Hire of Room for One Year	10	0	0
Fire and Light at Meetings	0	10	6
Table for Microscope with Drawer	1	4	0
Contribution to Library	15	0	0
Purchase of Microscope, including double Nose Piece, and Conveyance	10	14	6
Subscription to Ray Society	1	1	0
"Kentish Gazette" for Printing Reports, &c.	4	4	0
Hon. Assistant Secretary, Petty Cash	1	0	0
James E. Adlard for 200 Copies of Transactions	0	10	6
Postage, &c. by Treasurer	0	3	0
	44	7	6
Balance in hand 31st December, 1873	4	10	3
	£48	17	9

W. H. HORSLEY, Colonel,
Hon. Treasurer.

LIST OF BOOKS AND PERIODICALS

Belonging to the East Kent Natural History Society.

British Land and Fresh Water Molluscs, 1 vol. (Reeve)
Bryologia Britannica, 1 vol. (Wilson)
Synopsis of British Sea Weeds, 1 vol. (Harvey)
Flora of Surrey, 1 vol. (J. A. Brewer)
Manual of Geology, 1 vol. (Professor Phillips)
Flora of East Kent, 1 vol.
Morris's British Butterflies, 1 vol.
Ramsay's Physical Geography of Great Britain, 1 vol.
Dallas's Animal Kingdom, 1 vol.
Johnstone's British Zoophytes, 2 vols.
A Catalogue of Rare Phænogamous Plants collected in South Kent in 1829
Memoirs of the Geological Survey of Great Britain, 2 Nos. referring to Sheets 4 and 7
British Hemiptera, Heteroptera, 1 vol., 1865 (Douglas and Scott)
Hand Book of British Flora, 2 vols. (Bentley)
Miscellaneous Botanical Works of Robert Brown, 3 vols.
Recent Memoirs on the Cetacea, 1 vol.
Monograph of British Spongiadæ, by Dr. Bowerbank, 2 vols.
Conybeare and Phillips' Geology, 1 vol.
Bell's British Quadrupeds, 1 vol.
Atlas of British Sea Weeds, drawn by Mrs. Gatie from Professor Harvey's Phycologia Britannica, 1 vol.
Couch's Fishes, 4 vols.
Forbes's British Star Fishes, 1 vol.
Owen's Comparative Anatomy, 3 vols.
Kirby's British Bees, 2 vols.
Smith's English Flora, 4 vols.
Ralf's Desmidiæ, 1 vol.
Nitzsch's Pterylography.
Hooker's Jungermanniæ, 1 vol.
Smith's Diatomaceæ, 2 vols.
Works of W. Hewson, F.R.S., 1 vol., edited by G. Gulliver, F.R.S.
Parker's Structure and Development of the Shoulder Girdle and Strenum in the Vertebrata, 1 vol.
Lyell's Principles of Geology, 10th edition, 2 vols.
Masters's Vegetable Teratology, 1 vol.
Bevan on the Honey Bee, edited by Major Munn, F.R.H.S., 1 vol.
Gosse's Marine Zoology, 2 vols.
Haughton's Three Kingdoms of Nature, 1 vol.
Westwood's Modern Classification of Insects, 2 vols., 8vo.
Rymer Jones' Outlines of Organization of Animal Kingdom, 1 vol.
Quekett's Lectures on Histology, &c., 2 vols.
A Monograph of the Gymnoblastic or Tubularian Hydroids, by G. J. Allman, M.D., parts 1 and 2.
Pulteney's Progress of Botany in England.
Pulteney's Account of the Life and Writings of Linnæus.
Berkeley's Cryptogamic Botany.
Pritchard's History of Infusoria.
Baird's Entomostraca, Ray Society.
Siebold on Parthenogenesis.
Barclay on Life and Organization.
Carpenter's Comparative Physiology.
Micrographic Dictionary, 12 parts of the new edition.
Loudon Encyclopædia of Plants, with 2 supplements.
Kirby and Spence's Introduction to Entomology, 4 vols.
Allman's Freshwater Polyzoa } Bound in 1 vol.
Burmeister's Trilobites }

Treasury of Botany, 2 vols., by Lindley and Moore.
Darwin's Cirripedia, Ray Society, vols. 1 and 2.
Williamson's Recent Foraminifera, vol. 1.
Leighton's Lichen Flora, British, vol. 1.
Henfrey's Elementary Botany, 2nd edition, by Dr. Masters, F.R.S.
Clarke's Common Sea Weeds.
Reports on Zoology, for 1843 and 1844, Ray Society.
Bates' Phasmidæ (pamphlet)
Lubbock's Chlœone (ditto)
On Preparing and Mounting Microscopic Objects, by Mr. Fullagar.

PAMPHLETS.

British Moths, Nocturni.
,, Geometræ.
Memoirs pour servir a la connaissance des Crinoides vivants, par Michael Sars.
Etudes sur les Affinites Chimiques par MM. Guldberg et Waage.
Notes on Lemnaceæ and the Raphidian Character of Plants, by G. Gulliver, F.R.S.
Sketches to a Scale of the Auditory Organs of Molluscs, by G. Gulliver, F.R.S.
On the Muscular Sheath of the Œsophagus of the "Aye, Aye," (Chiromys Madagascariensis), by G. Gulliver, F.R.S.
On the Fibres of the Crystalline Lens of the Petromyzonini, by G. Gulliver, F.R.S.
The Diatom Prism and the true form of Diatom Markings. The Microscope Prism and the Structure of the Podura Scales, by the Rev. J. B. Reade, F.R.S.
Le Glacier de Boinon, per Mons. S. A. Saxe.
On a Fern-stem (Osmundites Dowkeri) from the Eocine of Herne Bay, by Mr. Carruthers.
On the Chalk of Thanet and East Kent, by G. Dowker, F.G.S.
On the Œsophogus of Sauropsida and other Vertebrata, by G. Gulliver, F.R.S.
On the Red Corpuscles of the Blood of Moschus, Tragulus, and Orycteropus, by G. Gulliver, F.R.S.
Crustacea Amphipoda Borealia et Arctica, by Axel Boeck.
Phanerogamer og Bregner, by A. Blytt (from the Royal University of Norway).
Third Annual Report of the Folkestone Natural History Society for 1871.
First Report of the Proceedings of the Croydon Microscopical Club for 1871.
Third Annual Report of the Eastbourne Natural History Society for 1871.
West Kent Natural History Society's Report for 1871.
Ten Papers by the late George Newport, F.R.S., extracted from the Transactions of the Royal and Linnæan Societies; presented by Mr. R. J. Bell, St. Margaret's Street, Canterbury.
Memoirs on the Blood of Lamna cornubica, &c., by the author, G. Gulliver, F.R.S.
The Bee Keeper's Magazine (one number only) by Major Munn.
Portlock's Geological Report on Londonderry, and part of Tyrone and Fermanagh, by W. Whitaker, Esq., Geological Museum, Jermyn-street.
Proceedings of the Eastbourne Natural History Society for portions of 1872 and 1873
A Paper on the Œsophagus, of the Red Hornbill, from G. Gulliver, Esq., F.R.S.
Seven Pamphlets on various subjects, from the Secretary C. Holst of the Royal University of Christiana.
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A Paper from Eastbourne Natural History Society, on a New Fungus, by C. T. Muller, Esq.

PERIODICALS.

Natural History Review, vol. 3, 1863, and vol. 4, 1864.
The Zoologist, from 1843 to 1861, and from 1863 to 1869.
N.B.—The Zoologist for 1862 is incomplete.
The Quarterly Journal of Microscopical Science, old series, vol. 7, 1859, and vol. 8, 1860, new series, vol. 1, 1861, to vol. 8, 1868, vol. 2 excepted.
Magazine of Natural History, third series, vol. 3, 1859, to vol. 8, 1861, and vol. 11, 1863, to vol. 23, 1869.
The Geologist, vol. 2, 1852, vols. 3, 4, 6, and 7, 1864.
The Phytologist, vol. 3, 1859.
The Geological Magazine, vol. 1, 1864, to vol. 6, 1869.
Quarterly Journal of Science, vol. 1, 1864, to vol. 6, 1869.
Quarterly Journal of the Geological Society, vol. 20, 1864, to vol. 25, 1869.
The Natural History Repertory, 1865.
The Monthly Journal of the Royal Microscopical Society, 1st vol., 1869.

The Librarian regrets to state that in consequemce of several Periodicals not having been returned to the Library, nor any entry of them made in the book kept for the purpose in the Society's Reading Room, he has been unable to have the volumes to which they belong bound.

THE FOLLOWING PERIODICALS

ARE TAKEN IN BY THE SOCIETY VIZ.:

1. The Annuals and Magazine of Natural History.
2. Monthly Microscopical Journal.
3. The Zoologist.
4. The Geological Magazine.
5. Quarterly Journal of the Geological Society.
6. Science Gossip.
7. The Publications of the Ray Society.
8. The Quarterly Journal of Microscopical Science.

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EAST KENT NATURAL HISTORY SOCIETY.

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TITLE & OBJECTS OF THE SOCIETY.

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The objects of the East Kent Natural History Society shall be the Collection and Diffusion of Practical and Theoretical knowledge respecting Natural History, in all its Branches, both in relation to the particular District and the General Science.

RULES AND REGULATIONS.

MEMBERSHIP.

1. The Society shall consist of Ordinary, Honorary, and Corresponding Members, and of Associates.

2. Every candidate for admission into the Society as an Ordinary Member, must be proposed in writing by two Members, and the election shall be by show of hands or by ballot, taken at any meeting of the Committee, or at a General Meeting—one negative in five votes to exclude.

3. The Annual Subscriptions to be paid by Ordinary members shall be Ten Shillings; the Subscriptions shall become due on the 1st of January in each year, and shall be paid in advance for the current year. Any Member neglecting to pay his Subscription for three months after it is due, shall be applied to by the Treasurer or Secretary, and if the Subscription remain unpaid for three months after such application, he shall cease to be a Member of the Society.

4. The Committee shall have power to admit, without ballot, on the nomination of two Members, any Lady who shall be desirous of becoming an Ordinary Member, and her Subscription shall be Five Shillings. This rule shall apply also to such sons. brothers, and nephews of Ordinary

Members, as may be regularly resident in the same house with those Members.

5. Any persons distinguished for their researches in Natural History, for their liberality to the Society, or for their connection with similar Societies, may, on the recommendation of the Committee, be elected Honorary or Corresponding Members of this Society, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subjected to any of the expenses of the Society, and shall have no vote in its affairs, nor be entitled to take books out of the Library, nor to the Reports and Notices.

6. In order to encourage the study of Natural History among individuals of the class of Mechanics, &c., residing in the district, the Committee shall have power to admit individuals of that class as Associates, provided they shall first communicate some information or observation on Natural History, exhibit such specimens or present them to the Local Museums, as shall by their merits satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

MANAGEMENT, AND BUSINESS MEETINGS.

7. The affairs of the Society shall be conducted by a Committee of Management, which shall consist of a President, Vice-Presidents, a Treasurer, and an Honorary Secretary, and not less than six Members, who shall all be chosen at the Annual Meeting. Three Members of such Committee shall form a quorum. The Meetings shall be held at four o'clock p.m. on the first Saturday of every month, and at such other times as the Secretary may deem necessary. At any regular Meeting including a sufficient number of Committee-Members, they may then and there declare themselves and act as a Committee in the ordinary business of the Society.

8. An Annual Meeting shall be held, at four o'clock p.m., on the last Tuesday in January, in each year, at Canterbury, for the purpose of electing the Officers for the current year, receiving the Annual Statement of Accounts, and Report of the Committee, and conducting the general affairs of the Society. In case of necessity, the Committee may alter the hour, posting due notice thereof in the Society's room.

9. Special General Meetings may be summoned by the Committee, or by the Secretary, on the requisition (in writing) of any six Members of the Society, the specific purposes of the Meeting being stated in the notice, which shall be sent to each Member not less than one week before the time of such Meeting.

10. All questions discussed at the Meetings shall be decided by a majority of votes; and if upon any question the votes shall be equal, the Chairman of the Meeting shall have the second or casting vote.

11. In the event of any vacancy occurring in the Officers or Committee, between the Annual Meetings, the same shall be filled up by the Committee. The two Members who have been longest thereon, and have attended the fewest meetings thereof, during the preceding year, shall go out by rotation at the Annual Meeting.

12. In order to facilitate the objects of the Society, the Committee shall be empowered to appoint any member a Local Secretary for the town or district he may reside in. Such Local Secretary shall be *ex-officio* a Member of the Committee.

SCIENTIFIC MEETINGS AND EXCURSIONS.

13. The Meetings for Scientific Business shall be at seven o'clock p.m., in the first Wednesday of every month at Canterbury; also extra Meetings at such place and time as the Committee shall have posted due notice of on the Society's apartment. Each Member to have the right of introducing a Visitor at these Meetings.

14. There shall be ordinary Excursions on the Afternoon of the day of each Evening Scientific Meeting, and at other times if the Committee so appoint, time and place to be duly notified in the Society's room by the Committee; and Special Excursions at such times and places as may be approved by the Commitee, who shall consider written suggestions of Members on the subject.

15. Minutes of the Proceedings of all Meetings shall be entered by the Secretary in a Book kept for that purpose.

16. The Secretary to give seven days' notice of Special Excursions to every Member, stating the time and place thereof, &c.

LOCAL OR DISTRICT MEETINGS.

17. To promote still further the objects and interests of the Society Local Secretaries and Members are invited to organize Meetings or Excursions in their district; and to give notice of the same to the General and all the Local Secretaries ; stating the time and place of Meeting, and what particular subjects are to be brought forward.

COLLECTION OF SPECIMENS.

18. The Society, as soon as it may possess sufficient means, shall

endeavour to make a Collection of Objects of Natural History, both with a view of forming a Museum and distribution of Duplicate Specimens according to the Regulations to be adopted by the Committee.

LIBRARY.

19. Only Books and Periodicals connected with Natural History are to be purchased by the funds of the Society, and the number and particular books of this class to be purchased shall be determined by the Committee.

20. All the Books and Periodicals shall be kept in some convenient place, so that Members shall be able to refer to them, or take them out under such regulations as the Committee from time to time may think proper to make.

21. Members are also invited to lend Books for the use of the Library, reserving to themselves the full right of ownership; such books to be under the care of the Committee, and not allowed to be taken out of the Library.

22. In order to allow the Librarian to examine the Books, they must all be returned to the Library and none taken therefrom during the first week in every June.

REPORTS OF SCIENTIFIC MEETINGS.

January 2nd, 1873.

Mildness of the Weather at the close of the year 1872.—Colonel Cox read a paper recording the extraordinary weather, and its effects on organic and inorganic nature. In his garden, near Canterbury, on New Year's day was heard the song of the blackbird, song thrush, mistle thrush, robin, and starling. Of insects, the large and small tortoiseshell butterflies were sporting about, gnats playing in clouds in the garden, and many within doors; bees were flying about, lured from their hives by the warmth, in search of scanty food. He gathered at the same time in his garden a bouquet of roses, consisting of several varieties.

Beach Pebbles at Dover.—Though this place has a bad repute for good pebbles, Colonel Cox, after much experience there, found many fine specimens, among which were excellent Choanites, various Spongiadæ, and landscape stones; and of these and many others he displayed beautiful examples. Thus the microscopist at Dover should be in no want of splendid materials of this kind.

Stings of the Queen-Bee and Worker-Bee.—A paper by Major Munn was read, illustrated by drawings and specimens, on the honey-bee. The leading points he intended to prove are that, though the queen-bee has a sting and ejects venom therewith, she neither can nor does inflict a wound by penetration of the sting, but merely smears the poison on the stigmata of a rival queen during combats. Hence he insists on the importance of the facts to the apiarian and experimental physiologist, as the queen may be handled, even by the most delicate fingers, without the least fear of hurt by stinging. From specimens examined, at Major Munn's request, by Mr. G. Gulliver, of Pembroke College, Oxford, the queen's sting was found to be curved, larger, and slightly blunter, than that of the worker, and this last quite straight and very sharp; the queen's sting has three blunt barbs, and is about 1-360th of an inch in diameter; the worker's sting has from eight to ten sharp barbs, and is about 1-500th of an inch in diameter.

Pollen of Petasites fragrans.—This plant, which was imported from Italy in 1806, is becoming quite naturalised in many English and Irish places, and is abundant on a weedy waste on the north side of Canterbury Cathedral. The pollen is now extremely abundant, and its grains were shown to be beautiful objects for the microscope; their shape oval, each 1-500th of an inch long and 1-760th broad, and muricated, like the pollen of other *Compositæ*, on the surface, but becoming more or less spherical, with three scars apparent, when soaked in water or dilute sulphuric acid.

January 16th, 1873.

Manufacture of Agates at Oberstein.—Colonel Cox exhibited a

magnificent collection of agates through all their phases, from their natural state up to their final polishing by the art of the lapidary. He had collected them at or near Oberstein, a primitive town in the Grand Duchy of Oldenburgh, and read an interesting and elaborate paper descriptive of the methods by which the stones are procured and prepared, until they appear in the well-known ornaments.

Combats of the Queens of the Honey-Bee.—A paper by Major Munn was read. Referring to his observations at the last meeting on the stings of the worker-bee and queen-bee, he now gave the result of his experimental observations on the deadly fights between the queens. When two of them were put together into a bottle they fought at once, and the conquered one soon gave the death-cry, a sort of *pip, pip,* and the conqueror, having let the conquered go, proceeded to settle her own wings and to clean her antennæ. In upwards of a dozen such combats the poison was fatally introduced into the spiracles under the wings, by a sort of smearing process, and produced death in about twenty minutes, though when the poison was only applied by the victor to the abdominal spiracles of the vanquished the latter languished for some hours. Sometimes a single queen, like a game cock, would be victorious in two fights, one immediately after the other.

Hermaphroditism and excellence as Bee-provendor of Petasites fragrans —Mr. Gulliver produced numerous specimens now in full flower in order to demonstrate the true sexual character of this species, and that it is, contrary to the current descriptions of this genus in the floras, truly hermaphrodite, and not "diœcious or subdiœcious." Such is the early flowering of this plant, its multitudinous flowers, fragrance, and perennial luxuriant growth, as to be well worth the attention of bee masters. The pollen is so fully exposed on the exserted stamens and styles as to invite insects; and bees tempted out by a genial day in December, January, or February, might find a rich table when other food was scarce or absent. Hence *P. fragrans* would be pre-eminently valuable as the earliest provender for bees.

February 6th, 187?.

Polycystina from the Mediterranean.—Colonel Horsley showed some beautiful specimens, all more or less perforated, and some prolonged into spires. They were mostly fossil, and some of them from the rocks of Bermuda, the tripoli of Richmond, Virginia, and the Marls of Sicily.

Hydra vulgaris.—Mr. Fullagar showed a number of specimens of this species from his aquarium, some with two or three buds, a few of the young with tentacles expanded and about to leave the parent stem, and others just commencing to bud; also several very minute hydras which had lately made their appearance in the water, and which he concluded were produced from ova deposited last autumn.

March 6th, 1873.

Crystal Prisms.—These are prismatic plant-crystals, quite different from though often confounded with raphides. Mr. Fullagar exhibited specimens of the prisms in the bulb-scale of the onion, in order to show how a very beautiful misroscopic object is always at hand, and Colonel Horsley showed further that its beauty was much increased by polarised light. The crystals occur singly, very variable in size, lying across the tissue-cells, and in pretty crosses, soldered together at intersecting parts. According to Mr. Gulliver ('Annals of Nat. Hist.,' April, 1864) these prisms occur regularly in the bulb-scales of *Allium ascalonicum*, *A. Cepa*, *A. Porrum*, and *A. sativum*, but not in *A. schœnoprasum*, *A. angulosum*, *A Moly*, *A. magicum*, and *A. ursinum.* Crystal prisms, not in crosses, may be well examined at any time in such officinal things as guaiacum bark, quillaja, and the sweet-scented orris, and sometimes in company with raphides, in various fresh Iridacæ, such as *Iris germanica*, a very common plant in cottage gardens. Measurements and other details are given in the 'Popular Science Review,' vol. 4, p. 578.

Paramecium feeding on Desmids.—To show how freely Paramecium feeds at this season, Mr. Fullagar brought specimens from his aquarium, which were seen greedily injesting three species of *Closterium.*

April 3rd, 1873.

Raphides, Sphœraphides, and Crystal Prisms.—Slides, drawings, and extemporaneous preparations of these beautiful plant-crystals were exhibited and explained by Mr. Gulliver, who read a paper thereon, and remarked that, considering their interest both as microscopic objects and botanical characters, it is surprising that they have not received more attention. They are ignored in our Floras, and but crudely described in our treatises on the microscope. Hence, these crystals require more explicit treatment, so that experts may realise their value as taxonomic characters, and ladies and novices find an additional source of microscopic amusement and instruction for idle time, thus not idly spent. Our present knowledge of the value of raphides as natural characters in systematic botany is chiefly confined to the memoirs by the author, published piecemeal in various journals, and summarised in the 'Popular Science Review' up to October, 1865, since extended in the 'Annals of Natural History' of that year, and in several numbers of 'Seemann's Journal of Botany,' and the 'Quarterly Journal of Microscopical Science.' But independent inquirers have not yet subjected those observations to such practical criticism as would prove either their erroneousness or truthfulness. We hear only, and but seldom, of exceptions, whether correct or incorrect, as if these were not well known to be common to some of the best diagnostic characters in natural science.

The chief source of error has been in the confusion of terms, for

all sorts of microscopic crystals in plants are too commonly included under the term "raphides." But this error is quite fatal to any due estimate of their taxonomic value. Crystals of one form or other are common, and often abundant, in plants that never produce any raphides at all. Hence we have had and still have endless ambiguity and confusion, which it is to be hoped that the author's drawings and detailed descriptions, reproduced in the 'Science Gossip,' May 1, 1873, will correct in future. But, besides the vagueness of the current knowledge of the subject, a prevailing cause of the difficulty in the acceptance by systematists of the characters afforded by raphides, is the difficulty and extensiveness of the inquiry as to the value of such diagnoses. The question first to be determined concerns the constancy of raphides or other crystals in several single species of our native plants, at all periods of their growth and in every soil or situation; and then come the wider researches as to the constant absence of the crystals from other species, and the still more laborious task of carrying the whole investigation throughout the Flora of the world. On this last point the author's observations have been fragmentary only, but they have been continued for many years on British plants, with occasional elucidations by parallel examinations of exotic species. Difficulties will often occur. Thus, after searching for years for a plant of the Order Onagraceæ devoid of raphides, it was, seemingly, found in *Montinia*, but only to afford one of those exceptions that best prove the rule, as this genus, though placed in the Order Onagraceæ by Lindley, has since been removed from it to the Saxifragraceæ. The angular minute crystals, about 1-400th of an inch long and 1-20000th thick, occurring for the most part scattered here and there singly in the old leaves of *Gentiana acaulis*, and some other plants, are not true raphides.

April 17*th*, 1873.

Apparatus for Drawing Microscopic Objects.—Colonel Horsley exhibited for this purpose a very simple contrivance, which is easily used and need not cost a shilling. It consists of a deal box, four and a half inches square and nine inches in length, with a circular aperture at one end large enough to admit the draw-tube of the microscope with the eyepiece attached, and at the other end a square of ground glass of the same size as the box, the wood having been removed for the purpose. To obtain the desired image of the object the microscope is placed horizontally, with its eyepiece end into the hole made for it into the box, when the object is focussed and illuminated on the ground glass, and then very easily drawn by hand. The whole apparatus is more fully described in 'Science Gossip,' 1868, p. 236.

Queen of the Honey-Bee.—Major Munn exhibited drawings in illustration of the structure and functions of the oral apparatus of the queen as compared with the corresponding parts of the drone

and worker. He also continued his observations on the power of the queen to sting the hand, and decided the question, as before, in the negative.

Starch-sticks in the Latex of Spurges.—Colonel Horsley gave extemporaneous demonstrations of these in the milky juice of *Euphorbia amygdaloides.* These rods of starch are, in our Flora, sharply diagnostic of the genus *Euphorbia*, as described at a former meeting of the Society, reported in the 'Quart. Journ. of Mic. Science,' for January, 1872.

Red Flint.—Capt. S. Gordon McDakin submitted some observations on red flint found in chalk, near Canterbury, several feet below the surface, and suggested that in them microscopic examinations might detect fragments of sponges or other bodies which may be supposed to afford the iron that gives colour to the mass.

May 1st, 1873.

The meeting was fully occupied in the examinations of specimens provided by Colonel Horsley, Mr. Sibert Saunders, and Mr. Fullagar, of fluviatile and marine zoology, and fresh botanical specimens collected by Mrs. Dean.

May 15th, 1873.

Extirpation of Rare Plants.—Mrs. Dean brought several rare plants, and made the usual complaint that they are becoming gradually so scarce as to threaten their total extinction. Whereupon some strong observations were made on the rapacious cupidity of mere collectors, and the vain and absurd notion that a knowledge of botany consists in collecting specimens and calling them by their scientific names—an error fostered by the too common practice of societies in offering premiums for the largest collections, instead of being guided by the proper tests of the candidates' knowledge, which would nowise cause the destruction of our rare plants.

Senecio squalidus.—This ragwort, though reported in our Floras as peculiar to Oxford and Bideford, is abundant at Canterbury. The pollen-grains were examined by the Hon. Sec., and found to be oval and muricated, 1-800th of an inch long and 1-1143rd broad, and showing three scars when treated with sulphuric acid.

Crystal Prisms in the Ovary of Compositæ.—Of these Mr. Gulliver showed specimens in the ovary-coat of Cyanareæ, and described their taxonomic import. They are figured, with other plant-crystals, in 'Science Gossip,' May, 1873.

Shape of the Nucleus of the Blood-discs of Pyrenæmatous Vertebrates.—He also exhibited preparations from which it appeared that, stating the breadth of the nucleus at 1, its length is from 2 to 2½. This is the regular form in most birds, but there are exceptions, as in the common fowl, which has the nucleus much shorter, often merely suboval, and hence, perhaps, the German

error, by Rollett, in 'Stricker's Human and Comparative Histology,' that the nucleus of the pyrenæmata is "sometimes more or less circular, as in the birds, or elliptical, as in the frog."

June 5th, 1873.

Lophius piscatorius.—Mr. Sibert Saunders exhibited and described a specimen of this fish, about nine inches long, a female, with the ovaries quite immature. It was taken at Whitstable, where it is much less common than on some other parts of our coast. The blood-discs were examined by Mr. Gulliver, and found to be regularly oval, with the long diameter 1-1895th, the shorter diameter 1-2666th, and the thickness 1-8000th of an inch, these being average sizes, and larger than is common in osseous fishes, though rather smaller than in the Salmonidæ, of which these corpuscles are figured in the 'Proc. Zool. Soc.,' Nov. 19th, 1872.

Economy of Freshwater Polyps.—On this subject Mr. Fullagar continued his observations, and illustrated them by living specimens and drawings. He described the eggs of *Hydra viridis* as dark brown in colour, somewhat tuberculated on the surface, globular in shape, and about 1-66th of an inch in diameter. These were hatched in April, and while emerging from the ovum the young hydra had two short tentacles, to which a third was added about the seventh day, when the animal was free and able to adhere by its sucker to the glass. Though *H. vulgaris* regularly deposits its ova in the autumn, he has seen this species, in his aquarium, produce eggs during March, which were hatched early in May. He is preparing for publication descriptions and drawings of his observations.

Crystals on the Seed-coat of the Elm, and Character of the Epidermis of the Tway-blade.—Preparations and drawings of these were communicated by Mr. Gulliver. The substance of his observations thereon is given in his paper at page 290 of the number for July, 1873, of the 'Quarterly Journal of Microscopical Science.'

June 18th, 1873.

Hairs of Deutzia and Crystals of Platino-cyanide of Magnesium.—Colonel Horsley showed the effects of polarised light on these hairs and crystals, and how well these objects are adapted for this purpose, when viewed either by transmitted light or on a dark ground.

Muscular Coat of the Poison-bag of the Wasp.—This was shown by Mr. Gulliver, jun., to be formed, in the queens of *Vespa vulgaris*, of transversely-striped fibres, a structure which appears to be constant in this insect, since these striped fibres were plainly seen in every one of those queens which he had examined during the present year, although not at all in the same part of two queens of the honey-bee, which he had examined in like manner a little earlier in the same season; but he considers that the point

requires further inquiry, as he finds that the same difference exists between the poison-bags of the workers of these two insects.

Crystals in the Seed-coats of Plants.—Referring to the crystals in the testa of the elm, depicted by his father in the 'Quart. Journ. Micros. Science,' vol. xiii., New Ser., Mr. Geo. Gulliver exhibited similar crystals in the same part of the gooseberry and sycamore (*Ribes grossularia* and *Acer pseudo-platanus*); in the gooseberry thickly studded throughout the seed-skin, and in the sycamore and maple occurring in irregular patches that may not always be readily found. His father had discovered similar crystals constantly in the testa or pericarp in certain species of many orders, as Papaveraceæ, Tiliaceæ, Aceraceæ, Geraniaceæ, Grossulariaceæ, Compositæ, Primulaceæ, and Dioscoreaceæ, whereas in the same parts of numerous other orders such crystals are not present.

July 10*th*, 1873.

An excursion to the sea-side at Whitstable, when live specimens were examined of Menbranipora, Plumularia, Laomedea, Alcyonidium, Clavelina, Beroe, Cydippe, Æquoria, Eolis, Noctiluca, and clusters of infant Balani—all under Colonel Horsley's, Mr. Sibert Saunders's, Mr. Fullagar's, and Mr. R. J. Bell's microscopes.

Development of Oyster-spat.—Mr. Sibert Saunders described this, illustrating it by live specimens under the microscope, from the egg to the mature animal, and adding numerous interesting details concerning its spawning and the habits and economy of the young. When the embryo is first extruded, and almost invisible to the naked eye, it has a complete bivalve shell, of which both valves are convex, and not, as in the adult, one convex and the other flat. The young oyster, as soon as parted from its parent, swims freely about, by means of the cilia with which it is furnished even before it is hatched; and, after having become attached and fixed, it increases in the course of two months to the size of a silver fourpence. While swimming about, according to its habit, freely and vivaciously, the minute young oyster was shown to be a most curious and interesting microscopic object.

August 7*th*, 1873.

Mrs. Dean contributed several specimens of some flowering plants, which she had lately collected in the district.

Teeth of Gasteropod Molluscs.—Colonel Horsley exhibited many specimens of these in proof of their taxonomic value, and of their excellence as objects for experiments with polarized light.

Iron Ore at Whitstable.—Captain McDakin presented samples of ironstone taken from and near the railway-tunnel at Whitstable, where the bed of ironstone is from two to four feet in thickness, and is similar in appearance to, and of somewhat higher specific gravity than, the famous iron ore of the Northampton sands.

September 4th, 1873.

Queen-bees.—Major Munn brought no less than two dozen queen-bees, and showed their fights when two were put together in a bottle, and the structure and use made by them of their stings. That these are quite powerless to penetrate and so sting even the softest human hand was proved by ladies and others handling these insects with perfect impunity, though they resented this by protruding their stings and ejecting the poison, but could not pierce the skin of the offending person. The queens in their combats with each other inflict quickly fatal injury by injecting the sting-poison into the respiratory apparatus. The comparative structure shows why the worker-bee so easily stings its enemies, which the queen cannot do. As is shown by Mr. George Gulliver's dissections, the sting of the former is quite straight, thin, extremely sharp-pointed, and furnished with from eight to ten barbs ; while the queen's sting is curved, bluntish at the point, and possessed of only from two to four barbs. All these facts were shown by extemporaneous dissections under the microscope. At the same time were explained the tricks of the famous bee-master, Thomas Wildman, who flourished in the latter part of the last century, and was so much the wonder for his surprising command over bees that he was wont to to exhibit, surrounded by them, to the king and nobility, by whom he was offered a hundred guineas for his secret, which he refused to part with, and which Major Munn declared was simply using only queen-bees.

Pebbles and Flints.—Colonel Cox showed many specimens of beautiful coanites, landscape, and other pebbles, from Dover and Hastings, proving that the coast there is richer than is commonly supposed in those pebbles, and that their structure, with the included organic remains, especially of sponges, is most interesting for microscopic examination.

Mrs. Cole brought a large flint, which had been fractured at some remote time, and the fragments since reunited by a deposit of siliceous earth—a fact considered interesting as regards the still vexed question of the formation of flint-nodules.

October 2nd, 1873.

Crystals in Leguminous Plants.—The Hon. Sec. exhibited drawings and preparations, and gave practical demonstrations in the fresh plants, of the crystals of oxalate of lime which he had discovered in the leaves, pods, liber, and other parts of Leguminosæ, since illustrated by a plate in the December number, 1873, of the 'Monthly Microscopical Journal.' These crystals, mostly belonging to one or the other of the prismatic systems, he calls *short prismatic crystals*, thus distinguishing them from raphides. sphæraphides, long crystal prisms, or other forms of plant-crystals. The short prismatic crystals resemble those in the testa of the elm, described and figured in last July number of the 'Quarterly Journal of

Microscopical Science,' and are about 1-3000th of an inch in diameter, and occur very abundantly in chains of cells along the fibro-vascular bundles of the leaves, calyx, and pods, and also scattered throughout many membranous parts. In one inch of one vein of a single leaflet of clover he counted no less than 17,500 of the short prismatic crystals; and his lecture was concluded by observations on the significance of these crystals in the economy of animals and plants.

Dentate Scales of Pleuronectidae.—Mr. Hayward showed some prepared slides of the notched scales (ctenoid) of the sole, being a good example, contrary to the rule, of this form of scale in soft-finned fish.

November 5th, 1873.

The late Major William Augustus Munn.—Referring to the recent death of this eminent apiarian, and the loss which his widow and family and entomological science had sustained thereby, a motion expressive of the sympathy and regret of the Society, of which he had long been a most valuable member, was unanimously carried.

Statoblasts of Plumatella.—Colonel Horsley remarked the abundance of *Plumatella repens* about Canterbury, and how easily this beautiful species may be kept in the aquarium. This had enabled him to confirm Dr. Allman's observations, that the statoblasts are not ova, but a peculiar form of bud produced in the funiculus. The Colonel exhibited the statoblasts under the microscope, and suggested, for future research, the question as to how far they may admit of comparison with the winter ova of Rotifera, and the ephippia of Daphne.

Hydras and their Prey.—Mr. Fullagar showed many live specimens of *Hydra viridis* and *Cyclops quadricornis*. When the Cyclops was put to the Hydra, the former was instantly taken by the latter, sometimes ingested immediately, and often only seized or touched by the polyp's tentacles, and allowed to float away. But in either case the death of the prey was sure, as proved in many trials. Hence he concludes in the affirmative as to the vexed question of the power of the fresh-water polyp to destroy its prey by mere stinging.

December 4th, 1873.

Eggs of Fresh-water Polyps.—Mr. Fullagar exhibited and made some observations thereon. The ovum of *Hydra vulgaris* is of an orange color, and about 1-50th of an inch in diameter; the ovum of *Hydra viridis* is of a light brown colour, and about 1-66th of an inch in diameter; these ova of both species are spherical. An egg of *Hydra viridis*, detached from the parent towards the end of May, was hatched in his aquarium about thirty days thereafter.

Utricular Hairs of Chenopods.—The Hon. Sec. showed, by draw-

ings and preparations, that the so-called mealiness of these plants is produced by simple hairs of two or three cells, the terminal cell being dilated into a globular vesicle, numbers of which so reflect the light as to produce the mealy appearance. By transmitted light they appear colourless and transparent. The dilated terminal cell is about 1-266th of an inch in diameter.

Calcareous granules on Bryonia dioica.—These, commonly described by botanists as "asperities" or "callous points," he proved, by extemporaneous preparations and experiments, should be rather called *Calcareous granules ;* for this is their true nature, as they are composed of carbonate of lime. Each callous point is about 1-114th of an inch in diameter, and the smooth, shiny, constituent granules composing that point have an average size of 1-666th of an inch. This profusion of calcareous matter on the surface of the leaf of bryonia is remarkable, as this plant is generally devoid internally of any raphides, and contains an unusually small number of other saline crystals.

Sphæraphides and Epidermis of the leaf of the Tea Plant.—The public mind being now much interested about the adulterations of tea, the Hon. Sec. gave some demonstrations, and exhibited preparations, of the leaf of a fresh plant of *Thea viridis.* The epidermis on both sides of the leaf was shown to be composed alike of cells with sinuous margins (colpenchyma), with the addition on the epidermis of the under surface of oval stomata, and shortish, smooth, taper, slightly curved hairs. Throughout the parenchyma of the leaf were sphæraphides, thickly studded, and with a mean diameter of about 1-1000th of an inch ; and here and there were short strings of similar sphæraphides, only about half as large, on the fibro-vascular bundles. The composition of the sphæraphides appears to be chiefly oxalate of lime. They are not easy to find, in consequence of the density and opacity of the surrounding parts ; and this is probably the reason why these beautiful crystals have hitherto escaped discovery.

Value of Potass in Histological Phytotomy.—At the same time he remarked that the value of potass in separating the fibres, membranes, or cells, and clearing parts of plants for microscopical investigation, seems to have been insufficiently appreciated. He showed, for example, that by treatment with cold solution of this alkali, and still better by boiling in it portions of the tea leaf, the epidermis could easily be detached from both sides, leaving quite distinct the intervening layer of parenchyma and nerves, and thus beautifully exposing the sphæraphides. He had found the potass equally useful in disclosing the short prismatic crystals in leguminous and many different orders of plants, and in examination of the tea of commerce ; so that the heretofore refuse of the teapot may be made a very interesting subject for microscopical inquiry.

East Kent Natural History Society.

MEETINGS, 1874-75.

SCIENTIFIC, on WEDNESDAYS, at 7 o'clock p.m.

March	4, 1874.	October	7, 1874.
April	1, „	November	4, „
May	6, „	December	2, „
June	3, „	January	6, 1875.
July	1, „	February	3, „
August	5, „	March	3, „
September	2, „	April	7, „

COMMITTEE, on SATURDAYS, at 4 o'clock p.m.

February	7, 1874.	September	5, 1874.
March	7, „	October	3, „
April	4, „	November	7, „
May	2, „	December	5, „
June	6, „	January	2, 1875
July	4, „	February	6, „
August	1, „	March	6, „

ANNUAL MEETING,

TUESDAY, JANUARY 26, 1875, at 4 o'clock p.m.

Seventeenth Report

1874

OF THE

EAST KENT

Natural History Society,

ADOPTED AT THE

ANNUAL MEETING,

HELD AT CANTERBURY, ON JANUARY 26th, 1875.

CANTERBURY:

PRINTED AT THE "KENTISH GAZETTE" OFFICE, HIGH STREET.

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CONTENTS.

East Kent Natural History Society.

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REPORT OF THE COMMITTEE FOR THE YEAR 1874.

In compliance with the eighth rule of the Society's regulations, your Committee has now to give its Annual Report and Statement of Accounts for the past year; and in so doing is happy to say that the Society continues prosperous, losing nothing of its interest and usefulness.

The number of members at the end of the year 1873 was 97; during that year three died and six retired, while six new members joined, thus making the present total number 94. But though there thus appears a loss of three, this is more apparent than real, for there are now more paying members than ever, and the pecuniary balance to the credit of the Society, though a larger amount than before has been expended on the Library, is much greater than it was at the end of the preceding year. On the last day of that year, 1873, the balance in favour of the Society was £4 10s. 3d., and at the corresponding period of 1874, £16 1s. 2d. Of the £15 voted for the Library during the year just passed, a sum of £6 3s. 3d. has been spent in the purchase of new books, and £8 16s. 1d. in periodicals and binding 20 volumes, leaving 3s. 5d. in the hands of the Librarian. Additional apparatus for the Society's microscope has been procured from Messrs. Beck and Co., at a cost of £5 10s. The details of all this expenditure will be found in the Report of the Librarian.

Your Committee congratulates the Society on the steady increase of its capital in the Library, especially as it is the only collection of such books in this district, and they are eminently important for the use of the members. The microscope and its apparatus are also an addition to the stock of the Society, which has proved highly useful at the evening meeting and other times; and the Committee has again the pleasing duty of thanking Colonel Horsley, Mr. Sidney Harvey, and Mr. Fullagar, for the use of their instruments at those meetings.

Minutes of the proceedings have been kept, according to Rule 15, and may be seen by the members in the book under the care of Mr. Fullagar; the Proceedings of the Scientific Meetings being preserved from the *Kentish Gazette*, in which they are regularly reported with a care and accuracy very creditable to the local press. Only brief abstracts of these reports will be appended to the present Annual Report, as the originals are always ready for reference in the before-mentioned book, and the most novel and impor-

tant points have been published from time to time in the different scientific periodicals.

The Evening Meetings have been held quite regularly, and fairly attended; always including several ladies, who have taken an intelligent interest in the scientific business. And this your Committee regards as a gratifying fact, because it affords evidence of a disposition in the sex to enjoy amusement and instruction at once inexpensive and useful; and the value to them of some knowledge of natural science is now universally admitted, and has long been recognised in high quarters. Thus, for example, the illustrious British Admiral, Lord Collingwood, in the midst of the arduous duties of his eminent station, in 1806, the year after the memorable battle of Trafalgar, was not unmindful of the pleasures and advantages which his children ought to derive from natural history. 'I would have my girls,' he writes to his wife, 'gain such knowledge of the works of the Creation, that they may have a fixed idea of the nature of the Being who could be the author of such a world.'

But the benefit of natural history is by no means confined to teleology or natural theology. The importance of natural science has at last become well known to the educated public generally, and recognised in our great universities specially. Besides the eminent physical utility of such pursuits, they are scarcely less valuable morally. They multiply and refine enjoyments, and beguile idle time, then not idly spent. They may alleviate affliction and will cherish contentment; displace sordid cares and sensual degradations, by pure enjoyments at once social and independant; endear many a rural walk with delightful associations of flood and field, of each bushy dell and bosky bourn; and by such means lead us to a grateful appreciation of the blessings which are so lavishly provided for our pleasure and profit, and in short to see the Creator in the creation. At all events, the interest and value of natural science can no longer be contemned; for it has now become part and parcel of the course of liberal studies, and is advancing with such rapid and significant strides that it must be entertained accordingly; and it may be hoped to allure the understanding to its own improvement.

These are but a few of the reasons which your Committee might urge for the consideration of the many persons whose position renders them more or less responsible for the education of the rising generation, to contribute by all legitimate means towards the cultivation of natural history; and even if such reasons should seem ineffectual, it is surely, on the lower ground of mere polity, the interest of society that the popular mind should be engaged as much as possible in humanizing and instructive pursuits. Indeed, the evidence has now become irresistible that this is a serious social question, the significance of which is so rapidly appearing more and more plainly, that to persist in ignoring it would be a violation of a manifest duty.

Excursions have been frequent during the last year, when a few members joined in agreeable rambles about the neighbourhood, and brought the results, whether botanical or zoological, for examination and discussion at the scientific meetings. Occasionally there were larger gatherings, such as that in which numerous members were

hospitably entertained by Mr. Dowker, at Stourmouth, and another under the auspices of Colonel Horsley and Mr. Sibert Saunders, at Whitstable.

Your Committee, in conclusion, must state that the most cordial thanks of the Society are due to each and all of its officers, for the very careful and efficient manner in which they have discharged their several duties.

REPORT OF THE LIBRARIAN FOR THE YEAR 1874.

The sum at the disposal of the Librarian during the year 1874, voted from the general fund of the Society was £15, plus the balance, 2s. 9d., remaining from the previous year, making £15 2s. 9d.

Of this amount £6 3s. 3d. was spent in the purchase of new books, a list of which is given below, and £6 11s. 7d. for periodicals. For binding two years' periodicals, consisting of 20 vols., the cost was £2 4s. 6d., and there is a balance in hand of 3s. 5d.

The New Works consist of the following, viz. :—

1. Huxley's Hydrozoa (Oceanic), Ray Society.
2. Staveley's, British Insects.
3. Westwood's Butterflies of Great Britain.
4. Berkeley's British Mosses.
5. Larmark's Shells, by Hanley.
6. Turton's, Dr. W., Manual of Land and Fresh Water Shells.
7. Jacob's Catalogue of Plants of Faversham.
8. Wood's Common Shells of the Sea Shore.
9. Cassell's Book of Birds.
10. Gosse's History of British Sea Anemones.
11. World of the Sea, translated from the French by the Rev. H. Martyn Hart.
12. Micrographic Dictionary, Parts 13 to 17.

In return for the one guinea subscription annually to the Ray Society, the undermentioned works have been received during 1874, and added to the Library, viz. :—

Monograph of British Spongiadæ, Vol. III.
A Monograph of the British Annelids, Part I.
The Nemerteans, by W. C. McIntosh, M.D., F.R.S.E., F.L.S., &c., 1873. Part I. continued of the above, 1874.

The following Pamphlets were presented to the Society during the year 1874, viz. :—

By Eastbourne Natural History Society, A Paper on the Orchidaceæ found near Eastbourne, by Miss Hall and Miss A. Woodhouse; A Paper on *Adoxa Moschatellina*, by Miss A. Woodhouse.
A Pamphlet on Reminiscences of Animals, Birds, Fishes, and Meteorology, by Thomas Kingsford, Esq.
Sixth Annual Report of the Eastbourne Natural History Society.
Report of West Kent Microscopical and Photographic Society.
Pamphlet on The Development of Hydra Vulgaris, by James Fullagar, from the author.
Ninth Report of the Quekett Microscopical Club, for the year ending June, 1874, by T. Curteis, Esq.

FINANCIAL STATEMENT 1874.

RECEIPTS.

	£	s.	d.
Balance in hand 31st December, 1873	4	10	3
Subscriptions received in 1874, including Dover Branch for 1874, and arrears to 31st December, 1874	39	11	0
Add Balance in Bank on 1st January, 1874, less £4 10s. 3d. credited in cash account...............	13	2	8
	£57	3	11

EXPENDITURE.

	£	s.	d.
Hire of Room for One Year	10	0	0
Contribution to Library	15	0	0
Additional Apparatus to Society's Microscope ...	5	10	0
Subscription to Ray Society	1	1	0
"Kentish Gazette" for Printing Reports, Cards, &c.	6	5	1
Hon. Assistant Secretary, Petty Cash	1	0	0
Ditto for Coals, Oil, &c., at Meetings	2	3	8
Postage, &c., by Treasurer	0	3	0
	£41	2	9
Balance in hand 31st December, 1874	16	1	2
	£57	3	11

Examined and found correct January 22nd, 1875,
GEORGE RIGDEN.

W. H. HORSLEY, Colonel,
Hon. Treasurer.

Canterbury, 20th January, 1875.

LIST OF BOOKS AND PERIODICALS

Belonging to the East Kent Natural History Society.

British Land and Fresh Water Molluscs, 1 vol. (Reeve)
Bryologia Brittannica, 1 vol. (Wilson)
Synopsis of British Sea Weeds, 1 vol. (Harvey)
Flora of Surrey, 1 vol. (J. A. Brewer)
Manual of Geology, 1 vol. (Professor Phillips)
Flora of East Kent, 1 vol.
Morris's British Butterflies, 1 vol.
Ramsay's Physical Geography of Great Britain, 1 vol.
Dallas's Animal Kingdom, 1 vol.
Johnstone's British Zoophytes, 2 vols.
A Catalogue of Rare Phænogamous Plants collected in South Kent in 1829
Memoirs of the Geological Survey of Great Britain, 2 Nos. referring to Sheets 4 and 7
British Hemiptera, Heteroptera, 1 vol., 1865 (Douglas and Scott)
Hand Book of British Flora, 2 vols. (Bentham)
Miscellaneous Botanical Works of Robert Brown, 3 vols.
Recent Memoirs on the Cetacea, 1 vol.
Monograph of British Spongiadæ, by Dr. Bowerbank, 2 vols.
Conybeare and Phillips' Geology, 1 vol.
Bell's British Quadrupeds, 1 vol.
Atlas of British Sea Weeds, drawn by Mrs. Gatie from Professor Harvey's Phycologia Britannica, 1 vol.
Couch's Fishes, 4 vols.
Forbes's British Star Fishes, 1 vol.
Owen's Comparative Anatomy, 3 vols.
Kirby's British Bees, 2 vols.
Smith's English Flora, 4 vols.
Ralf's Desmidiæ, 1 vol.
Nitzsch's Pterylography.
Hooker's Jungermanniæ, 1 vol.
Smith's Diatomaceæ, 2 vols.
Works of W. Hewson, F.R.S., 1 vol., edited by G. Gulliver, F.R.S-
Parker's Structure and Development of the Shoulder Girdle and Strenum in the Vertebrata, 1 vol.
Lyell's Principles of Geology, 10th edition, 2 vols.
Master's Vegetable Teratology, 1 vol.
Bevan on the Honey Bee, edited by Major Munn, F.R.H.S., 1 vol.
Gosse's Marine Zoology, 2 vols.
Haughton's Three Kingdoms of Nature, 1 vol.
Westwood's Modern Classification of Insects, 2 vols., 8vo.
Rymer Jones' Outlines of Organization of Animal Kingdom, 1 vol.
Quekett's Lectures on Histology, &c., 2 vols.
A Monograph of the Gymnoblastic or Tubularian Hydroids, by G. J. Allman, M.D., parts 1 and 2.
Pulteney's Progress of Botany in England,
Pulteney's Account of the Life and Writings of Linnæus.
Berkeley's Cryptogamic Botany.
Pritchard's History of Infusoria.
Baird's Entomostraca, Ray Society.
Siebold on Parthenogenesis.
Barclay on Life and Organization.
Carpenter's Comparative Physiology.
Micrographic Dictionary, 17 parts of the new edition.
Loudon Encyclopædia of Plants, with 2 supplements.
Kirby and Spence's Introduction to Entomology, 4 vols.
Allman's Freshwater Polyzoa } Bound in 1 vol.
Burmeister's Trilobites }

Treasury of Botany, 2 vols., by Lindley and Moore.
Darwin's Cirripedia, Ray Society, vols. 1 and 2.
Williamson's Recent Foraminifera, vol. 1.
Leighton's Lichen Flora, British, vol. 1.
Henfrey's Elementary Botany, 2nd edition, by Dr. Masters, F.R.S.
Clarke's Common Sea Weeds.
Reports on Zoology, for 1843 and 1844, Ray Society.
Bates' Phasmidæ (pamphlet)
Lubbock's Chlœone (ditto)
On Preparing and Mounting Microscopic Objects, by Mr. Fullagar.
Oceanic Hydrozoa, by Huxley, crown folio, 1859.
British Annelids, by W. C. McIntosh, M.D., crown folio, part 1, 1873.
Ditto, by ditto, The Nemerteans, part 1 continued, 1874.
Larmark's Shells, by Hanley, 8vo.
Manual of Land and Fresh Water Shells, by Turton, Dr. W.
Book of Birds, Cassell's, 1 vol., 4to.
World of the Sea, translated from the French by Rev. H. Martyn Hart, Royal 8vo., 1869.
British Sea Anemones, by Gosse, Royal 8vo.
Butterflies of Great Britain, by J. O. Westwood, crown 4to., 1855.
British Spongiadæ, by Bowerbank, vol. 3, royal 8vo., 1874.
British Mosses, by Berkeley, royal 8vo., 1863.
British Insects, by Staveley, demy 8vo., 1871.
Faversham Plants, Jacob's, royal 12mo., 1777.
Common Shells of Sea Shore, by Wood, f. cap. 8vo., 1865.

PAMPHLETS.

British Moths, Nocturni.
,, Geometræ.
Memoirs pour servir a la connaissance des Crinoides vivants, par Michael Sars.
Etudes sur les Affinites Chimiques par MM. Guldberg et Waage.
Notes on Lemnaceæ and the Raphidian Character of Plants, by G. Gulliver, F.R.S.
Sketches to a Scale of the Auditory Organs of Molluscs, by G. Gulliver, F.R.S.
On the Muscular Sheath of the Œsophagus of the "Aye, Aye," (Chiromys Madagascariensis), by G. Gulliver, F.R.S.
On the Fibres of the Crystalline Lens of the Petromyzonini, by G. Gulliver, F.R.S.
The Diatom Prism and the true form of Diatom Markings. The Microscope Prism and the Structure of the Podura Scales, by the Rev. J. B. Reade, F.R.S.
Le Glacier de Boinon, per Mons. S. A. Saxe.
On a Fern-stem (Osmundites Dowkeri) from the Eocine of Herne Bay, by Mr. Carruthers.
On the Chalk of Thanet and East Kent, by G. Dowker, F.G.S.
On the Œsophogus of Sauropsida and other Vertebrata, by G. Gulliver, F.R.S.
On the Red Corpuscles of the Blood of Moschus, Tragulus, and Orycteropus, by G. Gulliver, F.R.S.
Crustacea Amphipoda Borealia et Arctica, by Axel Boeck.
Phanerogamer og Bregner, by A. Blytt (from the Royal University of Norway).
Third Annual Report of the Folkestone Natural History Society for 1871.
First Report of the Proceedings of the Croydon Microscopical Club for 1871.
Third Annual Report of the Eastbourne Natural History Society for 1871.
West Kent Natural History Society's Report for 1871.
Ten Papers by the late George Newport, F.R.S., extracted from the Transactions of the Royal and Linnæan Societies; presented by Mr. R. J. Bell, St Margaret's Street, Canterbury.
Memoirs on the Blood of Lamna cornubica, &c., by the author, G. Gulliver, F.R.S.
The Bee Keeper's Magazine (one number only), by Major Munn.
Portlock's Geological Report on Londonderry, and part of Tyrone and Fermanagh, by W. Whitaker, Esq., Geological Museum, Jermyn-street.

Proceedings of the Eastbourne Natural History Society for portions of 1872 and 1873.
A Paper on the Œsophagus, of the Red Hornbill, from G. Gulliver, Esq., F.R.S.
Seven Pamphlets on various subjects, from the Secretary C. Holst of the Royal University of Christiana.
On the Size of the Red Corpuscles of the Blood of the Salamander, &c., by the author, G. Gulliver, Esq., F.R.S.
Report of the West Kent Natural History Society for 1872.
List of Works on the Geology, Mineralogy, and Palæontology of the Hampshire Basin, by the author, W. Whitaker, Esq.
Paper on the Apiary, from the late Major Munn.
On the Crystals in the Testa of the Elm and the Character of the Epidermis of the Tway-Blade, by the author, G. Gulliver, Esq., F.R.S.
On the Measurement of the Red Corpuscles of the Blood of Batrachians, by the author, G. Gulliver, Esq., F.R.S.
A Paper from Eastbourne Natural History Society, on a New Fungus, by C. T. Muller, Esq.
A Paper from Ditto on the Orchidaceæ found near Eastbourne, by Miss Hall and Miss A. Woodhouse.
A Paper on Adoxa Moschatellina, by Miss A. Woodhouse.
A Pamphlet on Reminiscences of Animals, Birds, Fishes, and Meteorology, by Thomas Kingsford, Esq., Canterbury.
Sixth Annual Report of the Eastbourne Natural History Society.
Report of the West Kent Microscopical and Photographic Society.
Pamphlet on the Development of the Hydra Vulgaris, by James Fullagar, Canterbury.
Ninth Report of the Quekett Microscopical Club for the year ending June, 1874.

PERIODICALS.

Natural History Review, vol. 3, 1863, and vol. 4, 1864.
The Zoologist, from 1843 to 1861, and from 1863 to 1869.
N.B.—The Zoologist for 1862 is incomplete.
The Quarterly Journal of Microscopical Science, old series, vol. 7, 1859, and vol. 8, 1860, new series, vol. 1, 1861, to vol. 8, 1868, vol. 2 excepted.
Magazine of Natural History, third series, vol. 3, 1859, to vol. 8, 1861, and vol. 11, 1863, to vol. 23, 1869.
The Geologist, vol. 2, 1852, vols. 3, 4, 6, and 7, 1864.
The Phytologist, vol. 3, 1859.
The Geological Magazine, vol. 1, 1864, to vol. 6, 1869.
Quarterly Journal of Science, vol. 1, 1864, to vol. 6, 1869.
Quarterly Journal of the Geological Society, vol. 20, 1864, to vol. 25, 1869.
The Natural History Repertory, 1865.
The Monthly Journal of the Royal Microscopical Society, 1st vol., 1869.

The Librarian regrets to state that in consequence of several Periodicals not having been returned to the Library, nor any entry of them made in the book kept for the purpose in the Society's Reading Room, he has been unable to have the volumes to which they belong bound.

THE FOLLOWING PERIODICALS

ARE TAKEN IN BY THE SOCIETY, VIZ. :

1. The Annuals and Magazine of Natural History.
2. Monthly Microscopical Journal.
3. The Zoologist.
4. The Geological Magazine.
5. Quarterly Journal of the Geological Society.
6. Science Gossip.
7. The Publications of the Ray Society.
8. The Quarterly Journal of Microscopical Science.

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:0::0:

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EAST KENT NATURAL HISTORY SOCIETY.

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TITLE & OBJECTS OF THE SOCIETY.

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The objects of the East Kent Natural History Society shall be the Collection and Diffusion of Practical and Theoretical knowledge respecting Natural History, in all its Branches, both in relation to the particular District and the General Science.

RULES AND REGULATIONS.

MEMBERSHIP.

1. The Society shall consist of Ordinary, Honorary, and Corresponding Members, and of Associates,

2. Every candidate for admission into the Society as an Ordinary Member, must be proposed in writing by two Members, and the election shall be by show of hands or by ballot, taken at any meeting of the Committee, or at a General Meeting—one negative in five votes to exclude.

3. The Annual Subscriptions to be paid by Ordinary members shall be Ten Shillings; the Subscriptions shall become due on the 1st of January in each year, and shall be paid in advance for the current year. Any Member neglecting to pay his Subscription for three months after it is due, shall be applied to by the Treasurer or Secretary, and if the Subscription remain unpaid for three months after such application, he shall cease to be a Member of the Society.

4. The Committee shall have power to admit, without ballot, on the nomination of two Members, any Lady who shall be desirous of becoming an Ordinary Member, and her Subscription shall be Five Shillings. This rule shall apply also to such sons, brothers, and nephews of Ordinary

Members, as may be regularly resident in the same house with those Members.

5. Any persons distinguished for their researches in Natural History, for their liberality to the Society, or for their connection with similar Societies, may, on the recommendation of the Committee be elected Honorary or Corresponding Members of this Society, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subjected to any of the expenses of the Society, and shall have no vote in its affairs, nor be entitled to take books out of the Library, nor to the Reports and Notices.

6. In order to cultivate the study of Natural History among individuals of the class of Mechanics, &c., residing in the district, the Committee shall have power to admit individuals of that class as Associates, provided they shall first communicate some information or observation on Natural History, exhibit such specimens or present them to the Local Museums, as shall by their merits satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

MANAGEMENT AND BUSINESS MEETINGS.

7. The affairs of the Society shall be conducted by a Committee of Management, which shall consist of a President, Vice-Presidents, a Treasurer, and an Honorary Secretary, and not less than six Members, who shall all be chosen at the Annual Meeting. Three Members of such Committee shall form a quorum. The Meetings shall be held at four o'clock p.m. on the first Saturday in every month, and at such other times as the Secretary may deem necessary. At any regular Meeting including a sufficient number of Committee-Members, they may then and there declare themselves and act as a Committee in the ordinary business of the Society.

8. An Annual Meeting shall be held, at four o'clock p.m., on the last Tuesday in January, in each year, at Canterbury, for the purpose of electing the Officers for the current year, receiving the Annual Statement of Accounts, and Report of the Committee, and conducting the general affairs of the Society. In case of necessity, the Committee may alter the hour, posting due notice thereof in the Society's room.

9. Special General Meetings may be summoned by the Committee, or by the Secretary, on the requisition (in writing) of any six Members of the Society, the specific purposes of the Meeting being stated in the notice, which shall be sent to each Member not less than one week before the time of such Meeting.

10. All questions discussed at the Meetings shall be decided by a majority of votes; and if upon any question the votes shall be equal, the Chairman of the Meeting shall have the second or casting vote.

11. In the event of any vacancy occurring in the Officers or Committee, between the Annual Meetings, the same shall be filled up by the Committee. The two Members who have been longest thereon, and have attended the fewest meetings thereof, during the preceding year, shall go out by rotation at the Annual Meeting.

12. In order to facilitate the objects of the Society, the Committee shall be empowered to appoint any member a Local Secretary for the town or district he may reside in. Such Local Secretary shall be *ex-officio* a Member of the Committee.

SCIENTIFIC MEETINGS AND EXCURSIONS.

13. The Meetings for Scientific Business shall be at seven o'clock p.m., on the first Wednesday of every month at Canterbury; also extra Meetings at such place and time as the Committee shall have posted due notice of in the Society's apartment. Each Member to have the right of introducing a Visitor at these Meetings.

14. There shall be ordinary Excursions on the Afternoon of the day of each Evening Scientific Meeting, and at other times if the Committee so appoint, time and place to be duly notified in the Society's room by the Committee; and Special Excusions at such times and places as may be approved by the Committee, who shall consider written suggestions of Members on the subject.

15. Minutes of the Proceedings of all Meetings shall be entered by the Secretary in a Book kept for that purpose.

16. The Secretary to give seven days' notice of Special Excursions to every Member, stating the time and place, thereof, &c.

LOCAL OR DISTRICT MEETINGS.

17. To promote still further the objects and interests of the Society Local Secretaries and Members are invited to organize Meetings or Excursions in their district; and to give notice of the same to the General and all the Local Secretaries; stating the time and place of Meeting, and what particular subjects are to be brought forward.

COLLECTION OF SPECIMENS.

18. The Society as soon as it may possess sufficient means, shall

endeavour to make a Collection of Objects of Natural History, both with a view of forming a Museum and distribution of Duplicate Specimens according to the Regulations to be adopted by the Committee.

LIBRARY.

19. Only Books and Periodicals connected with Natural History are to be purchased by the funds of the Society, and the number and particular books of this class to be purchased shall be determined by the Committee.

20. All the Books and Periodicals shall be kept in some convenient place, so that Members shall be able to refer to them or take them out under such regulations as the Committee from time to time may think proper to make.

21. Members are also invited to lend Books for the use of the Library, reserving to themselves the full right of ownership; such Books to be under the care of the Committee, and not allowed to be taken out of the Library.

22. In order to allow the Librarian to examine the Books, they must all be returned to the Library and none taken therefrom during the first week in every June.

BRIEF ABSTRACTS OF THE REPORTS OF THE SCIENTIFIC MEETINGS.

January 1, 1874.

Colonel Horsley displayed under his microscope the stinging threads with their barbed heads of Hydra vulgaris; and the statoblasts of the fresh-water polyzoon Plumatella repens. Mr. Hayward produced a mounted specimen of the sting of the hornet, on which were counted eleven barbs. Mr. Fullagar showed and described several live Protozoa of the genus Amoeba.

February 5, 1874.

The evening was passed in the examination, under Colonel Horsley's microscope, of several specimens of Stephanoceros and Floscularia, all alive, from Mr. Fullagar's aquarium.

March 4, 1874.

Colonel Cox laid on the table, and made explanatory observations concerning a variety of polished Agates; including a singularly large and beautiful one, of an ochreous color from an oxide of iron; a fine example of sponge in silica; and choanite imbedded in silicate of lime, so as to show the connexion of the choanites with the chalk formation.

Mrs. Dean brought several specimens of the flowering plants growing wild in the district, and Mr. George Down some mosses and lichens in fruit. Colonel Horsley showed and described live specimens of Stephanoceros and Floscularia.

Fresh-water Polyps.—Mr. Fullagar, referring to his papers with engraved illustrations in "Science Gossip," described the development from the eggs of Hydra vulgaris and Hydra viridis, and the difference in the size and superficies of those eggs in the two species, largest and spinous in H. vulgaris, smaller and smoother in H. viridis. In one case the hatching of the egg took place in 55 days; of this species in every case the tentacles of the newly-hatched animals were fewer than in the adult.

April 1, 1874.

Mrs. Dean exhibited a collection of Phanerogamia, including beautiful plants of Adoxa moschatellina, all in bloom and wild in

the district. Mr. Dowker, F.G.S., sent some fine specimens of Nitella, from Stourmouth.

Breeding of Hydra viridis.—This species, Mr. Fullagar observes, produces eggs in the spring. He brought from his aquarium the animals, which appeared to be monoecious, having germ-cells and sperm-cells in the same individual.

Polycystina.—Pleurosigma.—Colonel Horsley showed mounted slides of Polycystina from the North Sea mud, Cuxhaven; also his method of viewing the markings on the valves of Pleurosigma. For this purpose he employs an objective of one-eighth inch focus, with the light reflected from the inside of a small plated tube placed under the stage of the microscope. With this arrangement the markings in P. angulatum appear either transverse or diagonal according to the direction of the light; in P. hippocampus either transverse or longitudinal, or crossing each other at right angles. These effects can be easily produced by moving the lamp gently from right to left, or *vice versâ*, in front of and somewhat close to he stage of the instrument.

May 6, 1874.

Reminiscences of Natural History near Canterbury—Mr. Reid. M.R.C.S., read a paper, by Mr. Kingsford, of observations by the author, near Barton House. They extend over a period of more than half a century, carrying us back to the time when the otter frequented the Stour, and the Fordwich trout was well known. The paper, abounding with interesting facts, including remarks on meteorology, has been published in a separate pamphlet, which can be seen in the Society's library.

June 3, 1874.

Mrs. Dean produced a fresh collection of flowering plants, including five orchids, all now in bloom and indigenous to the neighbourhood; Mrs. Terry some polished pebbles, agates, and petrified wood; Major Hall specimens of infusorial earth, fibres of the fossil wood of a conifer, and other interesting objects. Mr. Fullagar read a paper on the habits of Lissotriton, referring to his observations in "Science Gossip" for May; also crystals composed of sugar, obtained from the white flower of the azalea, which proved very beautiful objects for examination with polarized light. Colonel Horsley gave a practical demonstration of his easy and very simple method of micrometric measurements, as described by him at the meeting of the Society, April 17, 1873, and with reference to the description of the apparatus in "Science Gossip," 1868, p. 236. Mr. Dowker, F.G.S., sent an invitation to the members to

assemble at a Conversazioné at his residence, Stourmouth House, on the 25th of June.

June 25, 1874.

Upwards of fifty members and their friends accepted Mr. Dowker's hospitality, and after lunch the visitors were conducted over the host's geological museum. Rare Biritsh orchids were shown by the Rev. S. H. Cook and the Rev. F. T. Scott; a beautiful collection of pebbles and agates by Colonel Cox; Puccinea malvacearum and Hydras by Mr. Fullagar; a new Kentish Sea Anenome, marine Algæ and their fructification by Mr. Hillier; a collection of photographs by Mr. Dowker; vases and baskets of wild flowers of the neighbourhood, proving how gracefully they may be arranged for the adornment of the table, by the Misses Dowker; curious maps of the County of Kent, and a fine specimen of Sulphate of Barytes, by Mr. Gardner.

July 1, 1874.

Colonel Horsley and Mr. Fullagar displayed, under the microscope, several living specimens of Polyzoa and Rotifera, including Melicerta and Plumatella. Mrs. Terry sent a fine Cactus in full bloom, the flower being of a pure white color, the pollen-grains globular, smooth, white, and large.

Raphides as Diagnostic Characters.—Mrs. Dean brought a miscellaneous and rather large collection of wild Phanerogamia, which were carefully examined for raphides, when those acicular plant-crystals were found only in Galiaceæ and Onagraceæ; and always abundantly in all the species of these orders, which were thus, even in the smallest fragments of leaves or stems, easily distinguished from other allied orders, in conformity with the observations frequently made by Mr. Gulliver, at former meetings of the Society and elsewhere.

Birth of the Hair-Worm.—This creature, the Gordius aquaticus of Zoology, has been repeatedly found emerging from the abdomen of beetles in the neighbourhood of the Cathedral. These having been submitted by Mr. Pugh, to the Society, the Honorary Secretary determined the insect to be the churchyard Beetle (Blaps mortisaga) and the worms dioecious. They were quite lively, some partly escaped from their host, others nearly or quite coiled up within its abdomen, but all soon died when put into water; each worm was sexually mature, and the male may be known by his bifid tail. See October 7.

A Plea for the Starling.—These birds, being now destroyed wholesale by gardeners, were submitted to anatomical examination by the Hon. Sec. (Mr. Gulliver. F.R.S.), when he found the

stomach of the starlings crammed with insects, chiefly small coleoptera, mixed with fragments of cherries. Thus, even at this season, the starling must be more beneficial than injurious; and, as is well known, at all other seasons so useful, as to deserve, in the interest of husbandry, the most careful protection. He mentioned that he had known a tame hawk, kept in cherry trees while the fruit is ripe, quite effectual in keeping off small birds.

July 23, 1874.

Excursion to Whitstable.—This took place about noon, and was composed of numerous ladies and gentlemen, members of the Society and their friends. After an exploration of the coast, and that tongue of shingle which is called the Street, tho party assembled in the Music Hall, where the microscopes of Colonel Horsley, Major Hall, Mr. Dowker, Mr. Sibert Saunders, and Mr. Fullagar were set to work, the objects for examination being living specimens of the marine fauna, all invertebrates, collected a few hours previously. Living Oyster-spat was shown and described by Mr. Saunders, also the alternations of generations in the Medusæ; Colonel Horsley described the tubular Annelids, especially Sabellæ and Serpulæ, giving a detailed account of their structure and economy, and of their common and diagnostic characters, illustrated by extemporaneous preparations under the microscope. Mr. Dowker, F.G.S., gave copious notes of his observations on the Kentish Anemones. all Astræacea, and of the following species:—Actiniloba dianthus and its varieties, Sagartia miniata, Sagartia troglodytes, Sagartia viduata—a rare species which he had kept in a marine aquarium for fifteen years—Actinia mesembryanthemum, Telea crassicornis, and an Anemone new to the coast, if not a nondescript. sent by Mr. Hillier, of Ramsgate, approaching nearly to Sargatia rosea of Gosse.

August 5, 1874.

Colonel Horsley showed under his microscope live specimens of the oyster spat, obtained from Mr. Saunders, at Whitstable, (both the valves of these tiny oysters being convex and symmetrical,) actively swimming about by means of vibratile cilia; Mr. Fullagar the fresh-water Polyzoon, Lophopus crystallinus, which he had found abundantly near Chartham; Mr. Hayward various insect larvæ, among which was Acherontia atropos, with a description of the noise which this species makes in all stages of its life.

September 2, 1874.

Mrs. Dean sent a collection of flowering plants recently gathered

all in bloom, and including Glaucium maritimum, Crithmum maritimum, Peucedanum officinale, Lactuca saligna, Coryza squarrosa, Artemesia maritima, Neottia spiralis. Mrs. Wareham presented, as the result of an excursion to Perry Wood, several specimens of Hypnum, Bryum, Polytrichum, Gymnostomum, Encalypta, Tortula, Parmelia, Cetraria, Cladonia, Scyphophorus, and other cryptogamous plants; all of which were so beautifully arranged in a dish, as to show how admirably these humble plants may be made subservient to the decoration of the table, and with the advantage of being always available in the winter, when they are in perfection and more gaudy flowering plants are not procurable. Colonel Cox brought and dissected before the meeting a globular wasps' nest, and gave instructive observations thereon, especially as regards the habits and economy of Wasps and Bees, and their relations to the great plan of nature.

Lampreys.—Colonel Cox sent a fine example of Petromyzon marinus, taken in the Stour near Sturry Mill, May 12. This specimen was a male, thirty-two inches long, weighing about three pounds. The Hon. Secretary gave a lecture on the Lampreys, observing that all the British species inhabit the Stour, and referred for anatomical details to the memoir on these fishes which he had given, with engraved illustrations, in the "Proceedings of the Zoological Society," Dec. 6, 1870. There is a flat worm living inside the skull; which parasite, being new to science, and allied to Neuronaia Monroii of the Codfish family, he has named Neuronaia Lampetræ, as noticed in the Reports of former meetings, recorded in the "Quarterly Journal of Microscopical Science," Jan., 1872.

Extra Meeting, September 16, 1874.

Mrs. Dean sent a number of flowering plants, including Erigeron acris, which is rare in the district. Mr. Fullagar brought the eggs and recently hatched young of Hydra viridis; the first appearance of the generative cells was on March 26; they continued to increase up to May 13, and the first young hydras were hatched on the next following 25th of August, just five months after the eggs appeared.

Rotatorians at Chartham.—As a contribution towards the fauna of East Kent, Colonel Horsley exhibited a number of Wheel Animalcules collected in fresh water near Chartham, and gave a set of systematic observations on these creatures; the structure and economy of Tubicolaria, Melicerta, Floscularia, and Stephanoceros, being described and shown in live specimens under his microscope.

Clavelinadæ at Whitstable.—With the same object Mr. Sibert Saunders brought several Social Ascidians from the sea at Whitstable. He described their structure generally, and the circulation or motion of the blood in Botryllus and Distoma particularly,

showing the remarkable alternation in the flow of the nutritive fluid in these animals.

October 7, 1874.

Botanical specimens were sent by Mrs. Dean and Mr. Lord.

Hatching of Lophopus.—Specimens of this fresh-water polyzoon, with the statoblasts producing the young, were shown by Mr. Fullagar, who collected them near Chartham, and described them with their manner of generation; also from the same locality Tubicolaria najus, Vorticella and Rotifer.

Gordius aquaticus.—As noticed at this meeting on the 1st of July, this curious worm, which is of a dark colour, about eight inches long, and not much thicker than a bristle, is common about Canterbury in damp places, and is found in water-spouts and tanks. Mr. Norman sent live specimens of the creature which occurred, after heavy rains, in his yard. The fact should be interesting to medical practitioners, since this worm has been often asserted, and sometimes as erroneously admitted, to have been voided from the human bladder.

November 4, 1874.

Colonel Horsley exhibited a live and active loricated Polygastrican, allied to Vaginicola, but probably a new species. Mr. Sibert Saunders sent from Whitstable, Crenilabrus Tinca, or Ancient Wrasse, one of the spiny-rayed fishes which, contrary to the rule, has smooth-edged or placoid scales. Mr. Fullagar contributed more specimens of and observations on Lophopus crystallinus.

Gall Insects and their Ravages.—Mr. James Reid, M.R.C.S., brought and described specimens of Cynips quercus-petiolata, which he had hatched out from the smooth oak-galls now so common on the spray of the young oaks in Kentish coppices, though comparatively rare about a quarter of a century since. He suggested that the depredations of this insect might be easily and cheaply checked, and the galls utilised for their tannin, by employing children to gather them.

Sphæraphides in Urticaceæ and Leonurus.—The Honorary Secretary brought specimens of Urtica, Humulus, and Parietaria, and showed that all these plants contain two kinds of sphæraphides, those in the leaf-blade large and nearly smooth, and composed of carbonate of lime; in the pith and fibro-vascular bundles smaller and rougher, and composed of oxalate of lime. In the pith of the hop they are very abundant and beautiful, and may be mounted either dry or wet so as to make very pretty microscopic objects. The leaf-blade of Leonurus is a remarkable instance of a labiate plant having numerous large sphæraphides; these consist of Oxalate

of lime, and the pith is devoid of such crystals. These observations are published more fully in the Monthly Microscopical Journal, Dec. 1874.

December 2, 1874.

Measurements of Blood Corpuscles of Man, and of the Striæ of Pleurosigma.—Colonel Horsley showed and described the working of a micrometer eye-piece, which had been made for him by Messrs. Baker. Each of the divisions, with an object-glass of one-eighth of an inch focal length, being equal to 1-4000th of an English inch, and to 1-1200th of an inch with an objective of half an inch focus. To show how readily very minute objects can be measured with this instrument, red blood-corpuscles from the finger of one of the members were found to have an average diameter of 1-3200th of an inch; the striæ of Pleurosigma formosum 1-24,000th, and of of Pleurosigma angulatum 1-40,000th; and these measurements were as easily read off as those of larger objects by a foot-rule. The measurement of the red-corpuscles of human blood agrees with that given in Mr. Gulliver's well-known Tables, appended to the Sydenham Society's edition of the Works of William Hewson, F.R.S.

East Kent Natural History Society.

MEETINGS, 1875-76.

SCIENTIFIC, on WEDNESDAYS, at 7 o'clock p.m.

March	3, 1875.	October	6, 1875.
April	7, ,,	November	3, ,,
May	5, ,,	December	1, ,,
June	2, ,,	January	5, 1876.
July	7, ,,	February	2, ,,
August	4, ,,	March	1, ,,
September	1, ,,	April	5, ,,

COMMITTEE, on SATURDAYS, at 4 o'clock p.m.

February	6, 1875.	September	4, 1875.
March	6, ,,	October	2, ,,
April	3, ,,	November	6, ,,
May	1, ,,	December	4, ,,
June	5, ,,	January	1, 1876.
July	3, ,,	February	5, ,,
August	7, ,,	March	4 ,,

ANNUAL MEETING,

TUESDAY, JANUARY 25, 1876, at 4 o'clock p.m.

EIGHTEENTH REPORT

1875

OF THE

EAST KENT

Natural History Society,

ADOPTED AT THE

ANNUAL MEETING,

Held at Canterbury, on January 25th, 1876.

CANTERBURY:

PRINTED AT THE "KENTISH GAZETTE" OFFICE, HIGH STREET.

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CONTENTS.

East Kent Natural History Society.

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REPORT OF THE COMMITTEE FOR THE YEAR 1875.

The past year has, your committee regret to state, been marked by the loss to the Society of two of its vice-presidents, viz., Lord Fitzwalter and the Rev. F. T. Scott, vicar of Sibertswold, the former by death and the latter by resignation of membership, consequent upon inability to attend the meetings of the Society.

While deeply regretting the loss of the above mentioned valued friends of the Society and that of seven other members from various causes during the year under review, your committee are thankful to be able to report that there has been an accession of seven new members in the same period, thus making the total number 92 instead of 94 as it stood at the end of 1874.

The balance in favour of the Society on the 31st December, 1875, was £15 7s. 8d., against £16 1s. 2d. at the corresponding period of 1874. This does not, however, correctly represent the financial condition of the Society, for on the first mentioned date, arrears of subscriptions to the amount of nearly £20 were still due, a portion of which has since been paid into the Bank and doubtless more will follow. The total expenditure in 1875 amounted £33 1s. 6d. In this is included £15 grant to the library and £5 for additional apparatus to the Society's microscope. The report of the librarian shows in what manner the former sum has been appropriated. For the latter sum two very effective objectives, a half inch and a quarter inch, were purchased from Messrs. Baker and Co., after being tested and approved by three members of the committee. The instrument is now complete for all practical purposes, and is kept in the Society's room at No 12, St. Peter's-street, Canterbury, for the use of the members.

Minutes of the proceedings as reported in the *Kentish Gazette* from month to month have been kept according to Rule 15, and may be seen by the members in the book under the care of the Hon. Assistant Secretary, and which will be found usually on the table in the

Society's room. Brief abstracts of these proceedings will be appended to the present annual report.

The monthly evening scientific meetings have been held very regularly, and the subjects brought forward at them have been of a most interesting character. The attendance also has been very fair. There have been no excursions in any great strength as in former years, but from time to time a few members joined in agreeable rambles to the coast at Whitstable, and to Chartham and other places in the neighbourhood, bringing back with them a fair amount of spoil, in the shape of botanical and zoological specimens, for examination and discussion at the evening meetings.

Along with this report each member will receive a copy of Mr. Fullagar's paper with illustrations on the Actinophrys. This paper was read at a meeting of the Quekett Microscopical Club in London, and so highly was it thought of, that it has been printed at the expense of that Society for insertion in their annual report, and your committee, believing that it would be the wish of their members to be furnished with a copy for their own use, have requested that 150 copies may be supplied for the use of this Society, fifty of which, it is proposed, to make over to Mr. Fullagar as a free gift for his private use. The cost of the 150 copies, it is estimated, will amount to about £1 15s.

The cordial thanks of the Society are due to each and all of its Officers for the efficient manner in which they have discharged their several duties.

Your committee cannot close this report without an expression of their deep regret that the state of health of the Hon. Secretary, G. Gulliver, Esq., F.R.S., is such as to prevent his being present at the annual meeting. They sincerely trust that, by the blessing of Almighty God, he may soon be restored to health and able to continue his valuable services to the Society.

REPORT OF THE LIBRARIAN FOR 1875

At the close of 1874 a small balance of 3s. 5d. remained after paying for the books and periodicals, and binding of 20 volumes. In 1875 a grant of £15 was made from the general fund for the use of the library, making £15 3s. 5d. in all. Of this sum £7 1s. was laid out in the purchase of new books, a list of which is given below, and £5 11s. for periodicals. A further sum of £1 9s. 7d. was expended in binding 12 vols. of the previous year's periodicals, and 3s. in postage, &c., thus bringing up the total for the year to £14 4s. 7d., leaving a balance of 18s. 10d. in hand.

The new Books consist of the following, viz. :—

1. Carpenter's Foraminifera, (Ray Society).
2. Newman's Moths and Butterflies.
3. Evelyn's Silva.
4. Swan's Nervous System.
5. Berkeley's Fungology.
6. Monro's Structure of Fishes.
7. Curtis on Farm Insects.

In return for the annual subscription of one guinea to the Ray Society no work has been received during 1875, owing, probably, to delay in publication.

The following pamphlets, &c., were presented to the Society during 1875, viz. :—

52 Nos. of "Nature," by G. Rigden, Esq.
7 Pamphlets, by Dr. Wallich, on various subjects.
1 ditto by G. Gulliver, Esq., F.R.S., Review of the Works of Goodsir and other Physiologists.
1 ditto by ditto, On the Blood Corpuscles of Batrachians.
1 ditto by ditto, On Spæraphides in Urticaceæ and Leonurus.
1 ditto by ditto, On Blood Corpuscles of the Hippopotamus, eared Seal and Walrus.
1 ditto by ditto, Sketches of the Spermatozoa of Petromyzon.
Fourth and Fifth Annual Reports of Wellington College Natural Science Society for 1872-3 and 1873-4.
1 book by J. W. Z. Wright, Esq., Floral Guide of East Kent, 1839, M. H. Cowell.
10 Pamphlets from the University of Christiana.
1 Report of Eastbourne Natural History Society for 1874-5.

FINANCIAL STATEMENT, 1875.

RECEIPTS.

	£	s.	d.
Balance in hand 31st December, 1874	16	1	2
Subscriptions received in 1875, including Dover Branch, and arrears paid into the Bank up to 31st December, 1875	37	8	0
	£53	9	2

EXPENSES.

	£	s.	d.
Hire of Room for One Year	10	0	0
Contribution to Library	15	0	0
Additional Apparatus to the Society's Microscope	5	0	0
Subscription to Ray Society	1	1	0
"Kentish Gazette" for Reports, &c.	5	17	6
Hon. Assistant Secretary, Petty Cash	1	0	0
Postage, &c., by Treasurer	0	3	0
Balance in hand 31st December, 1875	15	7	8
	£53	9	2

Examined and found correct, January 22nd, 1876,
GEORGE RIGDEN,

W. H. HORSLEY, Colonel,
Hon. Treasurer,

Canterbury, 22nd January, 1876.

LIST OF BOOKS AND PERIODICALS.

BELONGING TO THE EAST KENT NATURAL HISTORY SOCIETY.

British Land and Fresh Water Molluscs, 1 vol. (Reeve)
Bryologia Britannica, 1 vol. (Wilson)
Synopsis of British Sea Weeds, (1 vol. (Harvey)
Flora of Surrey, 1 vol. (J. A. Brewer)
Manual of Geology, 1 vol. (Professor Phillips)
Flora of East Kent, 1 vol.
Morris's British Butterflies, 1 vol.
Ramsay's Physical Geography of Great Britain, 1 vol.
Dallas's Animal Kingdom, 1 vol.
Johnstone's British Zoophytes, 2 vols.
A Catalogue of Rare Phænogamous Plants collected in South Kent in 1829
Memoirs of the Geological Survey of Great Britain, 2 Nos. referring to Sheets 4 and 7
British Hemiptera, Heteroptera, 1 vol., 1865 (Douglas and Scott)
Hand Book of British Flora, 2 vols. (Bentham)
Miscellaneous Botanical Works of Robert Brown, 3 vols.
Recent Memoirs on the Cetacea, 1 vol.
Monograph of British Spongiadæ, by Dr. Bowerbank, 2 vols.
Conybeare and Phillips' Geology, 1 vol.
Bell's British Quadrupeds, 1 vol.
Atlas of British Sea Weeds, drawn by Mrs. Gatie from Professor Harvey's Phycologia Britannica, 1 vol.
Couch's Fishes, 4 vols.
Forbes's British Star Fishes, 1 vol.
Owen's Comparative Anatomy, 3 vols.
Kirby's British Bees, 2 vols.
Smith's English Flora, 4 vols.
Ralf's Desmidiæ, 1 vol.
Nitzch's Pterylography.
Hooker's Jungermanniæ, 1 vol.
Smith's Diatomaceæ, 2 vols.
Works of W. Hewson, F.R.S., 1 vol., edited by G. Gulliver, F.R.S.
Parker's Structure and Development of the Shoulder Girdle and Sternum in the Vertebrata, 1 vol.
Lyell's Principles of Geology, 10th edition, 2 vols.
Master's Vegetable Teratology, 1 vol.
Bevan on the Honey Bee, edited by Major Munn, F.R.H.S., 1 vol.
Gosse's Marine Zoology, 2 vols.
Haughton's Three Kingdoms of Nature, 1 vol.
Westwood's Modern Classification of Insects, 2 vols., 8vo.
Rymer Jones' Outlines of Organization of Animal Kingdom, 1 vol.
Quekett's Lectures on Histology, &c., 2 vols.
A Monograph of the Gymnoblastic or Tubularian Hydroids, by G. J. Allman, M.D., parts in 1 and 2.
Pulteney's Progress of Botany in England.
Pulteney's Account of the Life and Writings of Linnœus.
Berkeley's Cryptogamic Botany.
Pritchard's History of Infusoria.
Baird's Entomostraca, Ray Society.
Siebold on Parthenogenesis.
Barclay on Life and Organization.
Carpenter's Comparative Physiology.
Micrographic Dictionary, 17 parts of the new edition.
Loudon's Encyclopædia of Plants, with 2 supplements.

Kirby and Spence's Introduction to Entomology, 4 vols.
Allman's Freshwater Polyzoa } Bound in 1 vol.
Burmeister's Trilobites }
Treasury of Botany, 2 vols., by Lindley and Moore.
Darwin's Cirripedia, Ray Society, vols. 1 and 2.
Williamson's Recent Foraminifera, vol. 1.
Leighton's Lichen Flora, British, vol. 1.
Henfrey's Elementary Botany, 2nd edition, by Dr. Masters, F.R.S.
Clarke's Common Sea Weeds.
Reports on Zoology, for 1843 and 1844, Ray Society.
Bates' Phasmidæ (pamphlet)
Lubbock's Chlœone (ditto)
On Preparing and Mounting Microscopic Objects, by Mr. Fullagar.
Oceanic Hydrozoa, by Huxley, crown folio, 1859.
British Annelids, by W. C. McIntosh, M.D., crown folio, part 1, 1873.
Ditto, by ditto, The Nemerteans, part 1 continued, 1874.
Larmarck's Shells, by Hanley, 8vo.
Manual of Land and Fresh Water Shells, by Turton, Dr. W.
Book of Birds, Cassell's, 1 vol., 4to.
World of the Sea, translated from the French by Rev. H. Martyn Hart, Royal 8vo., 1869.
British Sea Anemones, by Gosse, Royal 8vo.
Butterflies of Great Britain, by J. O. Westwood, crown 4to., 1855.
British Spongiadæ, by Bowerbank, vol. 3, royal 8vo., 1874.
British Mosses, by Berkeley, royal 8vo., 1863.
British Insects, by Staveley, demy 8vo., 1871.
Faversham Plants, Jacob's, royal 12mo., 1777.
Common Shells of Sea Shore, by Wood, f. cap. 8vo., 1865.
Carpenters's Foraminifera, (Ray Society).
Newman's Moths and Butterflies.
Evelyn's Silva.
Swan's Nervous System.
Berkley's Fungology.
Monro's Structure of Fishes.
Curtis on Farm Insects.

PAMPHLETS.

British Moths, Nocturni.
,, Geometræ.
Memoirs pour servir a la connaissance des Crinoides vivants, par Michael Sars.
Etudes sur les Affinites Chimiques par MM. Guldberg et Waage.
Notes on Lemnaceæ and the Raphidian Character of Plants, by G. Gulliver, F.R.S.
Sketches to a Scale of the Auditory Organs of Molluscs, by G. Gulliver, F.R.S.
On the Muscular Sheath of the Œsophagus of the "Aye, Aye," (Chiromys Madagascariensis), by G. Gulliver, F.R.S.
On the Fibres of the Crystalline Lens of the Petromyzonini, by G. Gulliver, F.R.S.
The Diatom Prism and the true form of Diatom Markings. The Microscope Prism and the Structure of the Podura Scales, by the Rev. J. B. Reade, F.R.S.
Le Glacier de Boinon, per Mons. S. A. Saxe.
On a Fern-stem (Osmundites Dowkeri) from the Eocine of Herne Bay, by Mr. Carruthers,
On the Chalk of Thanet and East Kent, by G. Dowker, F.G.S.
On the Œsophagus of Sauropsida and other Vertebrata, by G. Gulliver, F.R.S.
On the Red Corpuscles of the Blood of Moschus, Tragulus, and Orycteropus, by G. Gulliver, F.R.S.

Crustacea Amphipoda Borealia et Arctica, by Axel Boeck.
Phanerogamer og Bregner, by A. Blytt (from the Royal University of Norway).
Third Annual Report of the Folkestone Natural History Society for 1871.
First Report of the Proceedings of the Croydon Microscopical Club for 1871.
Third Annual Report of the Eastbourne Natural History Society for 1871.
West Kent Natural History Society's Report for 1871.
Ten Papers by the late George Newport, F.R.S., extracted from the Transactions of the Royal and Linnæan Societies; presented by Mr. R. J. Bell, St. Margaret's Street, Canterbury.
Memoirs on the Blood of Lamna cornubica, &c., by the author, G. Gulliver, F.R.S.
The Bee Keeper's Magazine (one number only), by Major Munn.
Portlock's Geological Report on Londonderry, and part of Tyrone and Fermanagh, by W. Whitaker, Esq., Geological Museum, Jermyn-street.
Proceedings of the Eastbourne Natural History Society for portions of 1872 and 1873.
A Paper on the Œsophagus, of the Red Hornbill, from G. Gulliver, Esq., F.R.S.
Seven Pamphlets on various subjects, from the Secretary, C. Holst, of the Royal University of Christiana.
On the Size of the Red Corpuscles of the Blood of the Salamander, &c., by the author, G. Gulliver, Esq., F.R.S.
Report of the West Kent Natural History Society for 1872.
List of Works on the Geology, Mineralogy, and Palæontology of the Hampshire Basin, by the author, W. Whitaker, Esq.
Paper on the Apiary, from the late Major Munn.
On the Crystals in the Testa of the Elm and the Character of the Epidermis of the Tway-Blade, by the author, G. Gulliver, Esq., F.R.S.
On the Measurement of the Red Corpuscles of the Blood of Batrachians, by the author, G. Gulliver, Esq., F.R.S.
A Paper from Eastbourne Natural History Society, on a New Fungus, by C. T. Miller, Esq.
A Paper from Ditto on the Orchidaceæ found near Eastbourne, by Miss Hall and Miss A. Woodhouse.
A Paper on Adoxa Moschatellina, by Miss A. Woodhouse.
A Pamphlet on Reminiscences of Animals, Birds, Fishes, and Meteorology, by Thomas Kingsford, Esq., Canterbury.
Sixth Annual Report of the Eastbourne Natural History Society.
Report of the West Kent Microscopical and Photographic Society.
Pamphlet on the Development of the Hydra Vulgaris, by James Fullagar, Canterbury.
Ninth Report of the Quekett Microscopical Club for the year ending June, 1874.

52 Nos. of *Nature*, by G. Rigden, Esq.

7 Pamphlets, by Dr. Wallich, on various spbjects.

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1 book by J. W. Z. Wright, Esq., Floral Guide of East Kent, 1839, M. H. Cowell.

10 Pamphlets from the University of Christiana.

1 Report of Eastbourne Natural History Society for 1874-5.

PERIODICALS.

Natural History Review, vol. 3, 1863, and vol. 4, 1864.
The Zoologist, from 1843 to 1861, and from 1863 to 1869.

N.B.—The Zoologist for 1862 is incomplete.

The Quarterly Journal of Microscopical Science, old series, vol. 7, 1859, and vol, 8, 1860, new series, vol. 1, 1861, to vol. 8, 1868, vol. 2 excepted.
Magazine of Natural History, third series, vol. 3, 1859, to vol. 8, 1861, and vol. 11, 1863, to vol. 23, 1869.
The Geologist, vol. 2, 1852, vols. 3, 4, 6, and 7, 1864.
The Phytologist, vol. 3, 1859.
The Geological Magazine, vol. 1, 1864, to vol. 6, 1869.
Quarterly Journal of Science, vol. 1, 1864, to vol. 6, 1869.
Quarterly Journal of the Geological Society, vol. 20, 1864, to vol. 25, 1869.
The Natural History Repertory, 1865.
The Monthly Journal of the Royal Microscopical Society, 1st vol. 1869.

The Librarian regrets to state that in consequence of several Periodicals not having been returned to the Library, nor any entry of them made in the book kept for the purpose in the Society's Reading Room, he has been unable to have the volumes to which they belong bound.

THE FOLLOWING PERIODICALS.

ARE TAKEN IN BY THE SOCIETY, VIZ. :

1. The Annals and Magazine of Natural History.
2. Monthly Microscopical Journal.
3. The Zoologist.
4. The Geological Magazine.
5. Quarterly Journal of the Geological Society.
6. Science Gossip.
7. The Publications of the Ray Society.
8. The Quarterly Journal of Microscopical Science.

LIST OF OFFICERS AND MEMBERS.

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Taylor, Mrs. A. M. W.	North Street, Herne Bay.
Terry, Mrs.	Burgate Street, Canterbury.
Thomson, R. E., Esq.	Kenfield House, Petham.
Thomson, S. J., Esq.	Hospital, Canterbury.
Thompson, Lewis, Esq.	5, Eldon Place, Newcastle-on-Tyne.
Thompson, S. J., Esq.	Hospital, Canterbury.
Vlieland, Rev. J. N.	Stalisfield, near Faversham.
Wacher, C., Esq.	Chislet.
Wacher, F., Esq.	Canterbury.
Ward, Miss	High Street, Canterbury.
Wareham, Mrs.	Dane John, Canterbury.
Wetherelt, A., Esq.	67, Burgate Street, Canterbury.
Wray, Miss	9, St. George's Place, Canterbury.
Wyatt, Mr. A. G.	Mercery Lane, Canterbury.
Wright, J. W. Z., Esq.	Barton Fields, Canterbury.
Wright, Dr.	3, St. George's Fields.

HONORARY & CORRESPONDING MEMBERS.

Bartlett, A. D., Esq.	Zoological Gardens, London.
Bates, H. W., Esq.	London.
Bewsher, Charles, Esq.	St. Louis, Mauritius.
Boycott, J., Esq., M.D.	London.
Britton, J., Esq.	Royal Herbarian, Kew.
Kemp, Dr. William	Wellington, New Zealand.
Linford, Mr. J. S.	Charlton, Woolwich.
Masters, Dr. Maxwell, T., F.R.S.	Ealing.
Mitchinson, Right Rev. Dr.	Bishop of Barbados.
Sandilands, — Esq.	Cannings Down, Queensland, Australia.
Saunders, W. Wilson, Esq.	Worthing.
Trimen, H. Esq.	Botanical Department, British Museum.
Whitaker, W. Esq.	Geological Museum, Jermyn Street, London.

ASSOCIATES.

Baker, Mr.	Cattle Market, Sandwich.
Coppen, Mr. E.	Sibertswould.
Down, Mr.	St. Dunstan's Street, Canterbury.
Else, Mr. R.	Burgate Lane, Canterbury.
Gordon, Mr. W. C.	Museum, Dover.
Gutteridge, Mr.	Faversham.
Hayward, Mr. E. B.	6, Burgate Lane, Canterbury.
Kennett, Mr. W.	Fordwich.
Parren, Mr. W.	Canterbury.
Prebble, Mr. J. G.	Ramsgate.
Young, Mr.	Sittingbourne.

East Kent Natural History Society.

TITLE & OBJECTS OF THE SOCIETY.

The objects of the East Kent Natural History Society shall be the Collection and Diffusion of Practical and Theoretical knowledge respecting Natural History, in all its Branches, both in relation to the particular District and the General Science.

RULES AND REGULATIONS.

MEMBERSHIP.

1. The Society shall consist of Ordinary, Honorary, and Corresponding Members, and of Associates.

2. Every candidate for admission into the Society as an Ordinary Member, must be proposed in writing by two Members, and the election shall be by show of hands or by Ballot, taken at any meeting of the Committee, or at a General Meeting—one negative in five votes to exclude.

3. The Annual Subscriptions to be paid by Ordinary Members shall be Ten Shillings; the Subscriptions shall become due on the 1st of January in each year, and shall be paid in advance for the current year. Any Member neglecting to pay his Subscription for three months after it is due, shall be applied to by the Treasurer or Secretary, and if the Subscription remain unpaid for three months after such application, he shall cease to be a Member of the Society.

4. The Committee shall have power to admit, without ballot, on the nomination of two Members, any Lady who shall be desirous of becoming an Ordinary Member, and her Subscription shall be Five Shillings. This rule shall apply also to such sons, brothers, and nephews of Ordinary

Members, as may be regularly resident in the same house with those Members.

5. Any persons distinguished for their researches in Natural History, for their liberality to the Society, or for their connection with similar Societies, may, on the recommendation of the Committee be elected Honorary or Corresponding Members of this Society, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subjected to any of the expenses of the Society, and shall have no vote in its affairs, nor be entitled to take books out of the Library, nor to the Reports and Notices.

6. In order to cultivate the study of Natural History among individuals of the class of Mechanics, &c., residing in the district, the Committee shall have power to admit individuals of that class as Associates, provided they shall first communicate some information or observation on Natural History, exhibit such specimens or present them to the Local Museums, as shall by their merits satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

MANAGEMENT AND BUSINESS MEETINGS.

7. The affairs of the Society shall be conducted by a Committee of Management, which shall consist of a President, Vice-Presidents, a Treasurer, and an Honorary Secretary, and not less than six Members, who shall all be chosen at the Annual Meeting. Three Members of such Committee shall form a quorum. The Meetings shall be held at four o'clock p.m. on the 1st Saturday in every month, and at such other times as the Secretary may deem necessary. At any regular Meeting including a sufficient number of Committee-Members, they may then and there declare themselves and act as a Committee in the ordinary business of the Society.

8. An Annual Meeting shall be held at four o'clock p.m., on the last Tuesday in January, in each year, at Canterbury, for the purpose of electing the officers for the current year, receiving the Annual Statement of Accounts, and Report of the Committee, and conducting the general affairs of the Society. In case of necessity, the Committee may alter the hour, posting due notice thereof in the Society's room.

9. Special General Meetings may be summoned by the Committee, or by the Secretary, on the requisition (in writing) of any six Members of the Society, the specific purposes of the Meeting being stated in the notice, which shall be sent to each Member not less than one week before the time of such Meeting.

10. All questions discussed at the Meetings shall be decided by a majority of votes; and if upon any question the votes shall be equal, the Chairman of the Meeting shall have the second or casting vote.

11. In the event of any vacancy occurring in the Officers or Committee, between the Annual Meetings, the same shall be filled up by the Committee. The two Members who have been longest thereon, and have attended the fewest meetings thereof, during the preceding year, shall go out by rotation at the Annual Meeting.

12. In order to facilitate the objects of the Society, the Committee shall be empowered to appoint any member a Local Secretary for the town or district he may reside in. Such Local Secretary shall be *ex-officio* a Member of the Committee.

SCIENTIFIC MEETINGS AND EXCURSIONS.

13. The Meetings for Scientific Business shall be at seven o'clock p.m., on the first Wednesday of every month at Canterbury; also extra Meetings at such place and time as the Committee shall have posted due notice of in the Society's apartment. Each Member to have the right of introducing a Visitor at these Meetings.

14. There shall be ordinary Excursions on the Afternoon of the day of each Evening Scientific Meeting, and at other times if the Committee so appoint, time and place to be duly notified in the Society's room by the Committee; and Special Excursions at such times and places as may be approved by the Committee, who shall consider written suggestions of Members on the subject.

15. Minutes of the Proceedings of all Meetings shall be entered by the Secretary in a book kept for that purpose.

16. The Secretary to give seven days' notice of Special Excursions to every Member, stating the time and place, thereof, &c.

LOCAL OR DISTRICT MEETINGS.

17. To promote still further the objects and interests of the Society Local Secretaries and Members are invited to organize Meetings or Excursions in their district; and to give notice of the same to the General and all the Local Secretaries; stating the time and place of Meeting, and what particular subjects are to be brought forward.

COLLECTION OF SPECIMENS.

18. The Society as soon as it may possess sufficient means, shall

endeavour to make a Collection of Objects of Natural History, both with a view of forming a Museum and distribution of Duplicate Specimens according to the Regulations to be adopted by the Committee.

LIBRARY.

19. Only Books and Periodicals connected with Natural History are to be purchased by the funds of the Society, and the number and particular books of this class to be purchased shall be determined by the Committee.

20. All the Books and Periodicals shall be kept in some convenient place, so that Members shall be able to refer to them or take them out under such regulations as the Committee from time to time may think proper to make.

21. Members are also invited to lend Books for the use of the Library, reserving to themselves the full right of ownership; such Books to be under the care of the Committee, and not allowed to be taken out of the Library.

22. In order to allow the Librarian to examine the Books, they must all be returned to the Library and none taken therefrom during the first week in every June.

BRIEF ABSTRACTS OF THE REPORTS OF THE SCIENTIFIC MEETINGS IN 1875.

January 6.

Mrs. Dean exhibited fresh specimens in fruit of Mosses, Liverworts, and Lichens, from the neighbourhood of Canterbury. Mr. Fullagar brought living specimens of Polyzoa and Rotifera, among which was the Melicerta Ringens, which was seen in the exercise of its digestive function, the gizzard, or muscular bulb of the gullet in full activity, and the tube or case in which the creature lives under construction.

The Hon. Secretary, G. Gulliver, Esq., F.R.S., gave a discourse on walking sticks in general, and on those called "Bois Maigre" and "Bois dur" in particular, describing them for the first time in relation to their parent plants, viz , the former Securingea Nitida, a member of the Box tribe; and the latter a species of Cauthium, a member of the natural order of Cinchonaceæ.

February 3rd.

Colonel Horsley exhibited Sphæraphides in the pith of the Hop bine, with polarized light.

Major Hall contributed mounted slides of the palate of the Whelk, with its wonderful teeth; also of the hairs of insect larvæ and other objects.

Colonel Horsley read a paper on the Genus Vaginicola, describing in particular the species found by him in water brought from Chartham, and referred to in the proceedings of the scientific meeting held on the 2nd Nov., 1874. The life history of this minute creature, as observed by Mr. Fullagar, was fully described. The natural term of its life was ascertained to be about three months. Whether the species described in this paper belong to Vagnieola decumbens would seem to be an open question.

March 3rd.

Colonel Horsley exhibited living specimens of Lophopus, Tubularia Najas, and the tree Vorticella, with micrometrical observations on the last mentioned, showing that its mean diameter is about 1-600th of an inch.

Mr. R. J. Bell described certain parasites called Gregarinœ,

found abundantly in the earth-worm, explaining their structure and development.

Mr. Fullagar read a paper on Actinophrys sol, a full account of which, as read subsequently at the Quekett Club, in London, accompanies this report.

April 7.

Colonel Cox exhibited 15 different specimens of sponges in silica, found on the beach at Dover, Hastings, &c., some of which were beautifully polished by himself.

Colonel Horsley brought to the meeting a fresh male flower of Aucuba Japonica, rich in pollen, the grains of which were oval and measured 1-570th by 1-800th of an inch.

Major Hall exhibited under the microscope several specimens of fossil woods.

May 5.

Mr. Kyngdon, Secretary of the Margate Microscopical Club, exhibited slides of various Zoological objects; and Mr. Fullagar some broods of Plumatella Repens, issuing from the statoblasts. Mrs. Wareham brought stalactites and stalagmites from caverns.

June 9.

Mrs. Dean exhibited a collection of plants of the district, all in bloom; among them may be mentioned Ornithogalum umbellatum, Listera Nidus Avis, Aceras anthropophora, Silybum marianum.

Mr. Hayward exhibited the circulation of blood in the gills of tadpoles of the small smooth newt. Mr. Fullagar read his second paper on Actinophrys sol.

J. Reid, Esq., M.R.C.S., exhibited specimens of Orchis Militaris, and Tephrosanthos, obtained from Whitechurch, Oxfordshire, in order to show their distinctive features from any variety of Fusca found in East Kent, and said that so far as the observations of the Society had gone, Fusca alone was found in East Kent. He also exhibited specimens of Carex pendula, Vicia tetrasperma, Ornithopus purpusillus.

The specimen of Orchis Militaris was examined at the meeting and found to contain abundance of Raphides, like other members of the order.

July 7.

Mrs. Dean brought one of her many botanical contributions, containing the following plants, viz., Hypericum Hirstumu,

Orobanche Major, Ophrys apifera, Œnanthe fistulosa, Butomus umbellatus, Narthecium ossifragum; the last is common in bogs, but rare in the Canterbury district.

Captain J. G. McDakin exhibited a fine specimen of a free wasp's nest, about as big as a small orange, and of a texture resembling that of grey filtering paper.

With reference to the remarks on the pollen of the Aucuba Japonica, made at the April scientific meeting, Colonel Horsley brought that of its ally, the Cornel, Cornus Sanguinea, and showed that the latter exceeded the former in size, the dimensions being as follows:—

Aucuba Japonica ......1-720—1-900
Cornus Sanguinea ....1-455—1-600

Mr. Ben Bryan sent specimens of Gordius Aquaticus, belonging to the Nematoid group of parasitic worms.

Examples of the bronchial worm of the sheep were exhibited and explained to the meeting by Professor Gulliver. The worm is known to Zoologists as Strongylus filaria. It belongs to the nematoid group of entozoa and is allied to Sclerostoma syngamus, which infests the air passages of pheasants and other birds, and causes the well-known disease called the "gapes."

August 4.

Observations on the fertilization of Scabiosa Columbaria were furnished by Mrs. J. W. Horsley, of Dover, and read to the meeting. Some valuable remarks on the subject were added by the Hon. Secretary.

Mrs. Dean contributed her usual interesting assortment of flowering plants in season, including Chlora Perfoliata, Pimpinella Saxifraga, &c. After some remarks on the above, the Hon. Secretary drew attention to the fact that the specimen of Verbena Officinalis had a peculiar interest as being the only British representative of the order Verbenaceæ, which affords the highly valuable teak timber.

Colonel Horsley exhibited some beautiful living specimens, obtained from Whitstable, of Sertularia pinnata and pumila, Campanularia verticillata, and several specimens of marine Hydras. Also the young Bougainvillia fructicosa, just detached and swimming freely away, as figured on plate IX. of Allman's great work on the Hydroids.

Captain McDakin showed specimens of fossil Echini obtained from the South Coast and Canterbury gravels, and from the upper chalk at Stuppington.

September 1.

Mrs. Dean brought specimens of flowering plants, chiefly Exogens, now blooming in the neighbourhood. Among these may be mentioned Carduus nutuns and Gentiana campestris.

Zoology of the Whitstable "Street."—This so-called "street" is a tongue of shingle extending at low water for more than half a mile into the sea at right angles from the shore, and is highly favourable to researches in Marine Zoology and Botany. It deserves and will sooner or later acquire a more extended reputation than it has yet enjoyed. The Society often receives treasures from this quarter.

Mr. Ben. Bryan sent a specimen of the common long-eared bat, or Plecotus auritus, found alive near St. Thomas's Hill, and infested by numerous parasites of the acarine family of the species known as Pteroptus vespertilionis. The Hon. Secretary favoured the meeting with remarks thereon relating to its zoological affinities and structure. The hairs and cartilage of the external ear of this creature form very interesting microscopical objects.

Mr. W. Gardner sent from Bekesbourne a large potato beset by six or seven smaller tubers the size of marbles, which had burst from beneath the skin of the parent, so as to form an example of that phenomenon called "prolification."

October 6.

Mr. F. B. Kyngdon, Hon. Secretary of the Margate Microscopical Club attended and exhibited an admirable series of preparations illustrating the anatomy of spiders. He also gave a microscopic view of a mite which infests the gull, and which appeared allied to, if not identical with, the genus Dermanyssus.

Colonel Cox reported that he had lately shot two specimens of the Scolopax Major, or Great Snipe, at or near Sturry Marsh. This bird is a rare species in Britain.

Mr. Sibert Saunders brought from Whitstable a live specimen of a nereid worm, about a foot in length, showing well the action of the dorsal branchiæ with which it is beset, and the beautiful iridescent line along its body.

Captain McDakin exhibited a diagram of stratified sand, curiously contorted, exposed by road cutting at Herne Hill, near Faversham, and stated the cause of this stratification to be the oxidation of iron in the stone.

Carnivorous Plants.—Major Hall sent from Exeter a specimen of the Physianthus Albens, one of the Asclepiads, with white flowers, which had dilated tubes, wherein were common flies, humming bees, and moths, all imprisoned and killed. The Hon. Secretary remarked on the great interest lately excited by researches on

carnivorous plants, and stated it would be interesting if the actual digestion of these insects could be clearly proved.

J. Reid, Esq., M.R.C.S., exhibited an unusually large specimen, 16 inches in diameter, of the not common fungus Polyporus Betulinus, and also two specimens of Helvella crispa, a species of edible fungus.

Mr. W. Gardner sent from Bekesbourne a specimen of a large ichnumon fly, allied to, if not identical with, Pimpla persuasoria, which often haunts the flowers of umbelliferous plants. The Hon. Secretary made some interesting remarks on the value of these and other enemies to hurtful insect life to farmers and gardeners.

Mr. Fullagar continued his observations on Actinophrys eichhornii, illustrated by a series of splendid diagrams, all drawn by himself and admirably fitted for the purpose. It is hoped that a full account of this Radiolarian will shortly be given in a separate form.

November 3.

Captain McDakin exhibited a fine specimen of the Agaricus laccatus, very much admired for its beautiful colour, found in the woods near Harbledown.

Mr. Fullagar showed the earth cocoon formed underground by the larva of the Rose beetle, Cetonia aurata, together with a fine specimen of the beetle which had issued from the cocoon. This is a well-known Coleopterous insect. In the larval state it frequents rotten timber, and feeds upon the bits of wood composing Ants' nests, whence its name "King of the Ants."

December 1.

Mr. Reid, M.R.C.S., exhibited billets of the wood of the pear tree in which were excavations made by the caterpillars of the large nocturnal moth known as the Goat moth, or Cossus ligniperda. The larva undoubtedly feeds on the substance of the wood, proof of which was found in its stomach on dissection by the Hon. Secretary. The wood was obtained from Mr. Thomas Kingsford, of Barton, near Canterbury, whose letter on the subject was read at the meeting.

Mr. R. E. Thomson presented a beautiful fawn-coloured Wasps' nest taken from the roof of his coach house at Kenfield, near Petham, which was greatly admired.

East Kent Natural History Society.

MEETINGS, 1876-7.

SCIENTIFIC, on WEDNESDAYS, at 7 o'clock p.m.

March	1, 1876.	October	4, 1876.
April	5, „	November	1, „
May	3, „	December	6, „
June	7, „	January	3, 1877.
July	5, „	February	7, „
August	2, „	March	7, „
September	6, „	April	4, „

COMMITTEE, on SATURDAYS, at 4 o'clock p.m.

February	5, 1876.	September	2, 1876.
March	4, „	October	7, „
April	1, „	November	4, „
May	6, „	December	2, „
June	3, „	January	6, 1877.
July	1, „	February	3, „
August	5, „	March	3, „

ANNUAL MEETING,

TUESDAY, JANUARY 30, 1877, at 4 o'clock p.m.

Nineteenth Report

OF THE

EAST KENT

Natural History Society,

ADOPTED AT THE

ANNUAL MEETING,

Held at Canterbury on January 30th, 1877.

CANTERBURY:

PRINTED AT THE "KENTISH GAZETTE" OFFICE, HIGH-STREET.

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CONTENTS.

EAST KENT NATURAL HISTORY SOCIETY.

THE PRESIDENT'S ADDRESS.

Another anniversary of the East Kent Natural History Society calls for a retrospect as well as prospective view of our situation. We may look forward perhaps with greater hope for its useful action since its latter time has been spent in increased usefulness and active work among its members. The past has been chequered with phases of activity and relapse; the progress of time has not enabled us to realize all the sanguine anticipations we had formed of its usefulness, but though our progress has been slow it must be confessed that much good work has been accomplished. The first work which the Society was called on to perform was to bring prominently forward the many objects of Natural History with which we are surrounded, to enlist in its ranks all those who could aid in our researches, and encourage those who wished to learn something of the beauties and wonders of the animal and vegetable world. It is to be regretted that some of our earlier and active members have been removed from us; some by death and others from absence from our county, and some age or infirmity has deprived us of their services. Among the latter, none are more missed from our meetings than our valued and honorary Secretary. We trust that his health may be restored and that his useful aid and assistance may yet be secured to us. Of the second the Bishop of Barbadoes holds a conspicuous place in our memories. One of our best Apiarians and Microscopists death has claimed from us.

Looking to the future we may hope that the seed that has been sown is beginning to bear fruit; many new societies have sprung into existence in the county; the distance of our various active members from the scene of our meeting has caused them to restrict their labours to their more immediate neighbourhood; and though I could have wished they had still been of our number, I think it a good sign that these societies are prospering. I regret that our title now to an East Kent Society, has been jeopardized by our forgetfulness of the claims our distant members have to our consideration, and hope for the future we may find some means of bringing together our distant colonies with the Parent Society.

Another matter of regret to me is the little interest which appears shown in our labours by those in the City of Canterbury, who we

should expect to find at least giving their support to such a good work as the Society is accomplishing. Good work, I say advisedly, our work has at least had the merit of being educational, and that in a branch of learning that has been much neglected. I should have expected that those, whose position as the guardians of education, would have shown a more lively interest in our proceedings. They may perhaps have considered that some of our workers are not fitted by education or station for teachers, but I would have them remember that of all studies that of Natural History can least be learned by books. The practical illustrations which have been given in Natural History in connection with this Society have been eminently calculated to instruct and encourage workers in Natural History. Many of the papers and illustrations on Natural History subjects read and given before this Society have been appreciated by societies in London, and have found their way into many of the scientific papers that are published.

Perhaps some of those who hold aloof from our meetings may excuse themselves on the plea that they care but little for such studies. I would have them remember that the example of their presence would be followed by others, and that in this way they would greatly benefit us. Our Society has suffered much from the ridicule which some have thought fit to bestow, though I am glad to say we have outlived such discouragement. I fear there is something in the atmosphere of Cathedral towns not quite congenial to such societies. Archæology flourishes, but other subjects fare badly. These remarks are not intended to give offence to any one. I hope that the public will give me credit for these remarks, being dictated purely through my zeal for my favourite study. Glad indeed shall I be to find that any one has read them in a friendly spirit. Enough has, however, been said on the subject. I have a more congenial task before me in asking you to systematise the work before us. A want of funds has prevented our expending so much in printing and sending notices to members of all meetings, as we could wish. It would be most desirable that our proceedings should appear in some periodical which might be taken by all members. I must here express our thanks to the proprietors ef the "Kentish Gazette" that they have so uniformly assisted us in bringing this Society before its more distant members. One of the great advantages we should derive from a hearty co-operation of other societies of a kindred nature in East Kent would be the enabling us to publish such proceedings of all our papers of interest. And I can only wish for our excellent treasurer and librarian that his labours may be increased fourfold. The Library of Works of Reference in Natural History is now an invaluable boon to the members of the Society, our annual additions of expensive works having brought it up to the best collection in the county.

Lastly, I would suggest that our monthly meetings might be

made more profitable if we arranged that interesting observations and communications by members should be advertised by means of post-cards to all our members; this would entail additional expense, but I believe would conduce more than anything to keep up the interest of the Society in those living out of Canterbury, and it need not interfere with our usual monthly notice cards or the general conversational plan of proceedings.

A long contemplated work of tabulating the Flora and Fauna of East Kent still remains to be accomplished.

The usefulness of the Society, in an educational point of view, may be enhanced by some lectures of a popular character, provided the Committee see their way plainly to carry out such lectures profitably. Botanical and particularly geological excursions should be arranged, and these might well be organised in connection with other kindred societies in East Kent.

REPORT OF THE COMMITTEE FOR 1876.

Your Committee have the pleasure to report the continued prosperity of the Society as far as members are concerned. It has now ninety-five members, being an increase of three since the preceding year. But as respects funds, they regret to have to report a decrease in the receipts of £6 7s. 5d., which, together with an increase in the expenditure of £8 16s. 9d., occasions a deficit of 3s. 9d. in the financial statement for 1876, as presented by the hon. treasurer. It should be borne in mind, however, that there were arrears of subscription due on the 31st Dec., 1876, to the to the amount of £21 5s. 0d., a portion of which has been paid into the Bank. The total expenditure in 1876 amounted to £46 18s. 3d., inclusive of £15 to the library. The report of the hon. librarian shews in what manner this latter sum has been employed. As respects the increase in the general expenditure before mentioned, your Committee remark that it is owing to several causes, viz., 1st, charge for printing, the excess in which alone amounts to £4 4s. 7d.; then, 2nd, expenses connected with the soirée held in St. George's Hall, in the month of May, 1876, £4 2s. 5d.; and 3rd, the cost of 150 copies of Mr. Fullagar's papers on the Actinophrys Sol and Tubicularia Najas, £3 5s. A copy of the former paper was forwarded to each member with the Report of 1875, and one of the latter will accompany this report. There is also an addition of £1 5s. for rent owing to the change of locality. With the present number of subscribers, and supposing the subscriptions for the year all paid in, the receipts for the year would only amount to £36 15s., so that the expenditure of 1876 exceeds this sum by rather more than £10. This shows necessity for economy during the present year.

Meetings of the Society.—The monthly scientific meetings have been held as usual, in accordance with Rule 13. They were always pleasant and profitable, affording regular intercommunication of naturalists and their friends in the district, with the occasional and agreeable addition of visitors from a distance. Minutes of the proceedings have been regularly reported in the "Kentish Gazette," and of these copies are preserved in a book which is kept by Mr. Fullagar, ready for the inspection of any member. The subjects, in brief abstracts, are appended to the present annual report, as to reprint them fully would involve much expense, and would, moreover, require artistic illustrations, while the novel points of interest have already been published in the scientific journals of the metropolis. But though lectures and papers are not reprinted, your Committee are quite alive to their high value in popularizing a knowledge of natural science, and of the thanks which are therefore due to their authors. For this reason your Committee would invite more members to aid the Society by such useful services, reports of which would appear in one or other local newspaper, and so give a beneficial ventilation of the subjects. A very numerously attended natural history and microscopical party was held at St. George's Hall, Canterbury, in the month of May, which was much enjoyed by the members and their friends. On the 3rd August an excursion was made to Folkestone and its vicinity, under the guidance of the President, who explained the geological features of the district. The short excursions of the members, according to Rule 14, have been very frequent; and as they afford agreeable and profitable walks, it is to be hoped that they will become still more attended and approved when they are better known.

Officers of the Society.—The President has acted with remarkable zeal and ability. The Treasurer and Librarian has performed his duties with exemplary care and efficiency. The Honorary Secretary, though prevented by illness from attending the meetings, has been ever ready with his advice and assistance, of which the present report, mainly drawn up by him, is not the only example. The Honorary Assistant Secretary has given most essential aid in the general business of the Society, besides his valuable contributions to the scientific proceedings. The Auditor has been expert and useful in his department. And when it is considered that all these officers have gratuitously, and so well and truly, given their services, the Society must be regarded as most fortunate in this respect, while its most hearty thanks are accordingly due to each and all of them.

Provincial Museums.—Your Committee, bearing in mind Rule 18, enjoining that "The Society, as soon as it may possess sufficient means, shall make a collection of the objects of Natural History, both with a view to forming a Museum and the distribution of

Duplicate Specimens," regret to report that such means have not yet been acquired; though it is hoped that the steady prosperity of the Society will enable it at some future time to carry out the intentions expressed in the Rule. Meanwhile, as so much misapprehension concerning the objects, and misapplication of the funds, prevail in connection with local museums, your Honorary Secretary gave an address on the subject, which was published in the Annual Report of the Society for the year 1871, also in "Nature" and several other scientific journals about that time; and in "Land and Water," May 11, 1872, he extended his observations to Natural History Museums on the sea coast. But attention is still needed to the whole of this topic,* which is one of much importance in rational instruction, though at present too generally regarded with an indifference lamentably at variance with the interest entertained of late in school boards and other organizations for teaching. Hence, while the necessity lasts, your Committee may continue to draw attention to it from time to time, hoping thus to promote a good cause, and believing that this course is calculated to show how usefully local museums might be conducted to extend and advance the desirable object, which we have all so much at heart, of intellectual culture

A little consideration would prove that the municipal rates now squandered in support of those miscellaneous and motley gatherings and incoherent medleys, vaguely called Museums, would suffice for the formation and maintenance of Museums worthily so named, and admirably adapted by judicious selection and arrangement to forward the education of our youth, and the direction of all classes of the people in the study of natural science. But, so far from promoting this worthy end, the managers of many provincial museums seem to understand nothing more than the establishment of unmeaning curiosity shops, better fitted to amaze the eyes and puzzle the brains of the groundlings than to convey rational amusement and instruction to the people. Thus the study of the sciences of natural history is rather retarded than advanced, and the prevailing ignorance is maintained and confirmed; while Professor Boyd Dawkins, in his last address to the Literary and Philosophical Society of Manchester, as noticed in "Nature," December 7, 1876, still laments that a country museum in Britain is frequently "a large sort of advertising bazaar, or a receptacle for miscellaneous curiosities unfitted for a private house."

On the contrary, local Museums should be adapted to the best mental culture. They ought to have a few good preparations, whether exotic or native, to exhibit plainly the general principles

* So still think the scientific journals of the metropolis, as shown by their approval of this Report soon after its appearance in the "Kentish Gazette," Feb. 6, 1877. And in the same newspaper, Feb. 20, a leading article informs us that Mr. Mundella has already promoted a bill on the subject in the House of Commons.

of nature, and systematic sets of many specimens to display particularly the natural history of the district; while the needless and grievous expense of room and money, caused by the acquisition and preservation of a gallimaufry of unsuitable objects, should be most strictly avoided. These are the very points which are so regularly neglected that it becomes necessary to direct especial attention to them, and to keep the question alive until its importance comes to be generally recognised. And that this consummation, so devoutly to be wished, will not be much longer delayed, the recent progress of education, or at least instruction, affords good evidence. As our great universities and public schools have already admitted the importance of biological studies, we may confidently expect that their leading truths, and a conviction that Museums ought to be adapted and devoted to their proper use, will finally prevail. And this spread of knowledge will soon convince the rate-paying public that their rates should be expended with at least some regard to the instruction of the rising generation; and not, as is too commonly the case, in the cost of a jumble of foreign things, and native curiosities, fitted rather to gratify idle admiration than to satisfy rational curiosity; repelling too those gifts of desirable specimens, as well as the valuable services of scientific adepts, which would surely, under the proper management of a Museum, be available in its district.

Instead of such deplorable mistakes—to use the mildest term—your Committee submit that, to a museum judiciously constituted and conducted, naturalists would, from time to time and moved by a mere love of the subjects, freely make most useful contributions, seeing that they would be properly appreciated and likely to be useful. In a collection of this rational kind teachers could derive and impart to their pupils such a taste and knowledge as would prove permanently profitable to them and to society, and thus be led to realize and herald to the popular mind many of the noble results of the sciences of natural history. In such a museum, too, the farmer and gardener would find many useful records, including illustrative specimens of the insects and their economy which are either beneficial or hurtful to plants and animals, and which we cannot hope to encourage or check but through an accurate knowledge of their nature.

But it is not by mere or immediate utility that these studies and local museums are to be judged. By their monitory aid every rural walk would present a profusion of objects for pleasure and profit; and lessons would be learned of the countless plants and animals, their affinities and contrasts, structure and uses, and position in the great system of nature. Then, too, tutors and their pupils would come to look with an intelligent interest to the species which are more or less characteristic of the district or country in which they are found, and thus get a glimpse of the interesting subject of

the topography or geography of plants. And all this is exactly that sort of knowledge the acquisition of which should and might be assisted by a local museum, and from which school teachers and their disciples could always obtain information. Some of our country museums are already thus valuable; but these are exceptional, and though worthy of all praise and imitation, are too few to affect the general question, and indisputable fact, of the lamentable shortcomings of our provincial museums.

On the continent they are better arranged, judging from the evidence of Professor Boyd Dawkins, and the report of the eminent zoologist, A. de Quatrafages, in his "Rambles of a Naturalist" (8vo London, 1857, vol. 2, p. 253), accompanied by the now veteran Professor Milne Edwards: "In 1853, I reached Rochelle before night, and on the following morning I hastened to pay my respects to the elder M. d'Orbigny, one of the veterans of marine zoology. Like most men who have worked hard themselves, M. d'Orbigny gives a hearty welcome to all those who follow in his own steps. On the strength of my title as a naturalist I was received as an old friend. I soon made the acquaintance of several men devoted to the study of the natural sciences, and in their company I visited the museum, in which they had made a most interesting collection of the different productions belonging to the three kingdoms of nature which are to be obtained in the department of the Lower Charente. Having examined this local fauna in the museum, I at once understood the nature of the district that I was about to investigate."

Your Committee have pleasure in directing attention to this statement by Mons de Quatrafages, because it plainly shows what sort of questions should arise in the minds of intelligent visitors after their examination of a provincial museum, and what, as a matter of course, we have a right to expect of any such institution, supported by compulsory rates; and how, moreover, it should act as an agreeable link in the kin of all true naturalists, as it did at the brave little town of Rochelle. In our own country similar and not less intelligent views are entertained by more naturalists than the examples of so many defective local museums would seem to indicate, and have been expressed of late by our respected vice-president, Mr. H. Lee, of Croydon, by Mr. Alexander Murray, of Hastings, by the editor of "Nature," of the "Athenæum," and others. The distinguished Scotch philosopher, Sir David Brewster, held a still higher opinion of local museums. He thought that, if properly conducted, they would in the long run promote concord among nations. When presiding at the Peace Congress, held in London, 1851, he said—"Were our youth better instructed than they are in the popular departments of phyisical and natural science, subjects with which no deeds of heroism or personal adventure are associated; and were every school to have a Museum, containing objects of natural history, the amusements of the school would assume a different character, and the scholars

would go into active life better fitted for those peaceful professions to which ere long they must be confined" Had he lived to see the happy increase of aquariums, he might have added that their popularity would be shared by museums, whenever a knowledge of the subject had become sufficiently extended and practised.

Scholastic Value of Natural History.—But in advocating the interest and instruction of the biological sciences, and asserting their especial excellence in awaking and training the minds of young persons to observation and reflection on the works of the Creator, thereby delightfully and beneficially exercising the reasoning faculties, your Committee would wish to avoid the too common error of injuring a good cause by attempting to prove too much. For the present, knowledge of organic or living nature is, and long will be, in a very fluctuating and progressive state; and however this may increase its interest, it so diminishes its value in mental training as to give place in this respect to the exact sciences and fixed languages. With these the contrast is remarkable of such vexed questions as those concerning the earliest zoological fossil, *Eozoon*, and the latest and most extended animal, *Bathybius*, said on the highest authority to be "ready for development in any direction," but now consigned to the limbo of error, and likely to be followed thither by several wild biological speculations. Nor are the continual and vexatious changes in natural history systems and nomenclature less objectionable in scholastic work. But the mistakes and perplexities in the sciences of natural history are no argument against their importance, and of their value in education—as opposed to mere instruction—though fairly to be considered when it is urgently proposed to displace or altogether supersede by these sciences the time-honoured subjects of school tuition.

Extirpation of Rare Animals and Plants.—This objection, often fairly urged against natural history societies, is not applicable to the East Kent Society. Its members generally, in co-operation with your Committee, have always endeavoured to preserve our local fauna and flora, and accordingly have never offered prizes for the "best collection" of either plants or animals; and though this practice has been encouraged by several other societies, your Committee have steadily discountenanced it. And your Committee believe that, if the questionable course be pursued of trying to induce young persons to study natural history by pecuniary rewards, this could be best effected by means that would spare rare species. Thus, instead of favouring their destruction by premiums, like the rewards of our forefathers for wolves' heads, the diligence and attainments of young persons might be better excited and tried by inducing them to study the nature and economy of common or even noxious animals and plants. For examples, the specific characters of the Roses,

Brambles, Willows, and Sedges of the district would be excellent exercises; so would the intimate structure of many other genera or orders of plants, including their glands, hairs, tissue-cells, pollen, and the distribution and significance of raphides and other plant-crystals. And as to animals, the structure and metamorphoses and general economy of such common insects as the cockchafer and cranefly would be equally eligible. These all belong to an extensive class of subjects which might be so contracted or expanded as to afford a variety to suit every occasion, and are never likely to be exhausted.

REPORT OF THE LIBRARIAN FOR 1876.

The amount at the disposal of the Librarian for the purchase of books, periodicals and binding in the year under review, was £15 18s. 10d., consisting of a balance of 18s. 10d. from the previous year, and a grant of £15 from the general fund of the Society. Of this sum £8 2s. 0d. were laid out in the purchase of new books, a list of which is given below, and £4 13s. 8d. for periodicals. A further sum of £1 4s. 7d. was expended in binding 9 vols. of the previous year's periodicals, and 2s. 6d. in the carriage of books and postage, leaving a balance of £1 16s. 1d. in hand.

The new books purchased consist of the following, viz. :—

Essays, by Wells, with Memoir of his Life. 8vo., 1 vol., 1818.
British Confervæ, by Dillwyn, 1 vol., 4to., 1809.
Natural History of the Polype, by Baker, 1 vol., 8vo., 1743.
Monographia Anoplurorum Britanniæ, by Denny, 1 vol., 8vo., 1842.
British Naked Eyed Medusæ. by Prof. E. Forbes, 1 vol., 4to , Ray Society, 1848.
The Depths of the Sea, by Wyville Thomson, 1 vol., 8vo., 1873
Evenings at the Microscope, by Gosse, 1 vol., 8vo., 1859.
Natural History and Antiquities of Selborne, by Gilbert White, edited by E. T. Bennett, with additional notes by James E. Harting, F.L.S., &c., 1 vol., royal 8vo., 1875.
English Entomologist, by T. Martyn, 1 vol., 4to., 1792.
British Butterflies and their Transformations, by Westwood and Humphreys, 1 vol., 4to., 1841.
Insectiverous Plants, by Darwin, 1 vol., 8vo., 1875.

In return for the annual subscription of one guinea to the Ray Society, the Society has received the following new work, viz. :

Monograph of the British Aphides, by G. B. Buckton, vol. 1, 8vo., 1876.

The following pamphlets, &c., were presented to the Society during 1876, viz. :—

Reminiscenses of Animals, Birds, Fishes, and Meteorology, by Thos. Kingsford, Barton House, Canterbury.
Nos. of "Nature," by G. Rigden, Esq.
Eight Pamphlets, by Dr. Wallich. on various subjects.
The Eighth Annual Report of the Eastbourne Natural History Society.
Report and Transactions of the Cardiff Naturalists' Society.
A Pamphlet on the Comparison of the Metamorphosis of the Cranefly and the Blowfly, by the Author, Mr. A. Hammond, of Sheerness.

FINANCIAL STATEMENT, 1876.

RECEIPTS.

	£	s.	d.
Balance in hand 31st December, 1875	15	7	8
Subscriptions in 1876	31	0	6
Cash in Treasurer's hands	0	6	4
Deficit	0	3	9
	£46	18	3

EXPENDITURE.

	£	s.	d.
Rent of Room for Nine Months at £10 per annum	7	10	0
Do. of do. for Three Months at £15	3	15	0
Contributions to Library	15	0	0
Subscriptions to Ray Society	1	1	0
"Kentish Gazette" for Printing Reports	5	18	6
Expenses for Soireé, after deducting receipts	4	2	5
Hon. Assistant Secretary for Petty Charges	1	5	9
Do. for Post Cards and Wrappers, &c.	1	15	1
Do. for Lamps, Oil, &c., for Meetings	0	15	0
Mr. Fullagar for 150 copies of his Paper on Actinophrys Sol	1	15	0
Do. for do. on Tubicolaria Najas	1	10	0
Postage, &c., by Treasurer	0	2	0
"Kentish Gazette" Bill for Printing Cards, &c., for Soireé Excursion and Lecture	2	8	6
	£46	18	3

Examined and found correct, January 22nd, 1877,
GEORGE RIGDEN.

W. H. HORSLEY, Colonel,
Hon. Treasurer.

Canterbury, 27th January, 1877.

LIST OF BOOKS AND PERIODICALS

Belonging to the East Kent Natural History Society.

British Land and Fresh Water Molluscs, 1 vol. (Reeve)
Bryologia Britannica, 1 vol. (Wilson)
Synopsis of British Sea Weeds, 1 vol. (Harvey)
Flora of Surrey, 1 vol. (J. A. Brewer)
Manual of Geology, 1 vol. (Professor Phillips)
Flora of East Kent, 1 vol.
Morris's British Butterflies, 1 vol.
Ramsay's Physical Geography of Great Britain, 1 vol.
Dallas's Animal Kingdom, 1 vol.
Johnstone's British Zoophytes, 2 vols.
A Catalogue of Rare Phænogamous Plants collected in South Kent in 1829
Memoirs of the Geological Survey of Great Britain, 2 Nos. referring to Sheets 4 and 7
British Hemiptera, Heteroptera, 1 vol. 1865 (Douglas and Scott)
Hand Book of British Flora, 2 vols. (Bentham)
Miscellaneous Botanical Works of Robert Brown, 3 vols.
Recent Memoirs on the Cetacea, 1 vol.
Monograph of British Spongiadæ, by Dr. Bowerbank 2 vols.
Conybeare and Phillips' Geology, 1 vol.
Bell's British Quadrupeds, 1 vol.
Atlas of British Sea Weeds, drawn by Mrs. Gatty from Professor Harvey's Phycologia Britannica, 1 vol.
Couch's Fishes, 4 vols.
Forbes' British Star Fishes, 1 vol.
Owen's Comparative Anatomy, 3 vols.
Kirby's British Bees, 2 vols.
Smith's English Flora, 4 vols.
Ralf's Desmidiæ, 1 vol.
Nitzch's Pterylography
Hooker's Jungermanniæ, 1 vol.
Smith's Diatomaceæ, 2 vols.
Works of W. Hewson, F.R.S., 1 vol., edited by G. Gulliver, F.R.S.
Parker's Structure and Development of the Shoulder Girdle and Strenum in the Vertebrata, 1 vol.
Lyell's Principles of Geology, 10th edition, 2 vols.
Master's Vegetable Teratology, 1 vol.
Bevan on the Honey Bee, edited by Major Munn, F.R.H.S., 1 vol.
Gosse's Marine Zoology, 2 vols.
Haughton's Three Kingdoms of Nature, 1 vol.
Westwood's Modern Classification of Insects, 2 vols., 8vo.
Rymer Jones' Outlines of Organization of Animal Kingdom, 1 vol.
Quekett's Lectures on Histology, &c., 2 vols.
A Monograph of the Gymnoblastic or Tubularian Hydroids, by G. J. Allman, M.D., parts—1 and 2
Pulteney's Progress of Botany in England
Pulteney's Account of the Life and Writings of Linnæus
Berkeley's Cryptogamic Botany
Pritchard's History of Infusoria
Baird's Entomostraca, Ray Society
Siebold on Parthenogenesis
Barclay on Life and Organization
Carpenter's Comparatve Physiology
Micrographic Dictionary, with plates, 2 vols., (New Edition)
Loudon's Encyclopædia of Plants, with 2 supplements

Kirby and Spence's Introduction to Entomology, 4 vols.
Allman's Freshwater Polyzoa } Bound in 1 vol.
Burmeister's Trilobites }
Treasurer of Botany, 2 vols., by Lindey and Moore
Darwin's Cirripedia, Ray Society, vols. 1 and 2
Williamson's Recent Foraminifera, vol. 1
Leighton's Lichen Flora, British, vol. 1
Heufrey's Elementary Botany, 2nd edition, by Dr. Masters, F.R.S.
Clarke's Common Sea Weeds
Reports on Zoology, for 1843 and 1844, Ray Society
Bates' Phasmidæ (pamphlet)
Lubbock's Chlœone (ditto)
On Preparing and Mounting Microscopic Objects
Oceanic Hydrozoa, by Huxley, crown folio, 1859
British Annelids, by W. C. McIntosh, M.D., crown folio, part 1, 1873
Ditto, by ditto, The Nemerteans, part 1 continued, 1874
Larmarck's Shells, by Hanley, 8vo.
Manual of Land and Fresh Water Shells, by Turton, Dr. W.
Book of Birds, Cassell's, 1 vol., 4to.
World of the Sea, translated from the French by Rev. H. Martyn Hart, Royal 8vo., 1869
British Sea Anemones, by Gosse, royal 8vo.
Butterflies of Great Britian, by J. O. Westwood, crown 4to., 1855
British Spongiadæ, Bowerbank, vol. 3, royal 8vo., 1874
British Mosses, by Berkeley, royal 8vo., 1863
British Insects, by Staveley, demy 8vo., 1871
Faversham Plants, Jacob's, royal 12mo., 1777
Common Shells of Sea Shore, by Wood, foolscap. 8vo., 1865
Carpenter's Foramenifera, (Ray Society)
Newman's Moths and Butterflies
Evelyn's Silva
Swan's Nervous System
Berkley's Fungology
Monro's Structure of Fishes
Curtis on Farm Insects
Essays, by Wells, with Memoir of his Life, 8vo., 1 vol., 1818
British Confervæ, by Dillwyn, 1 vol., 4to., 1809
Natural History of the Polype, by Baker, 1 vol., 8vo., 1743
Monographia Anoplurorum Britanuiæ, by Denny, 1 vol., 8vo., 1842
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Evenings at the Microscope, by Gosse, 1 vol., 8vo., 1859
Natural History and Antiquities of Selborne, by Gilbert White, edited by E. T. Bennett, with additional notes by James E. Harting, F.L.S., &c., 1 vol., royal 8vo., 1875.
English Entomologist, by T. Martyn, 1 vol., 4to., 1792
British Butterflies and their Transformations, by Westwood and Humphreys, 1 vol., 4to., 1841.
Insectiverous Plants, by Darwin, 1 vol., 8vo., 1875
Monograph of the British Aphides, by G. B. Buckton, vol. 1, 8vo., 1876, Ray Society.

PAMPHLETS.

British Moths, Nocturni
,, Geometræ
Memoirs pour servir a la connaissance des Crinoides vivants, par Michael Sars
Etudes sur les Affinites Chimiques par MM. Guldberg et Waage
Notes on Lemnaceæ and the Raphidian Character of Plants, by G. Gulliver, F.R.S.
Sketches to a Scale of the Auditory Organs of Molluscs, by G. Gulliver, F.R.S.
On the Muscular Sheath of the Œsophagus of the "Aye, Aye," (Chiromys Madagascariensis), by G. Gulliver, F.R.S.

On the Fibres of the Crystalline Lens of the Petromyzonini, by G. Gulliver, F.R.S.
The Diatom Prism and the true form of Diatom Markings. The Microscope Prism and the Structure of the Podura Scales, by the Rev. J. B. Reade, F.R.S.
Le Glacier de Boinon, per Mons. S. A. Saxe.
On a Fern-stem (Osmundites Dowkeri) from the Eocine of Herne Bay, by Mr. Carruthers
On the Chalk of Thanet and East Kent, by G. Dowker, F.G.S.
On the Œsophagus of Sauropsida and other Vertebrata, by G. Gulliver, F.R.S.
On the Red Corpuscles of the Blood of Moschus, Tragulus, and Orycteropus, by G. Gulliver, F.R.S,
Crustacea Amphipoda Borealia et Arctica, by Axel Boeck.
Phanerogamer og Bregner, by A. Blytt, (from the Royal University of Norway).
Third Annual Report of the Folkestone Natural History Socieiy for 1871
First Report of the Proceedings of the Croydon Microscopial Club for 1871
Third Annual Report of the Eastbourne Natural History Society for 1871
West Kent Natural History Society's Report for 1871
Ten Papers by the late George Newport, F.R.S., extracted from the Transactions of the Royal and Linnæan Societies; presented by Mr. R. J. Rell, St. Margaret's Street, Canterbury, bound in one volume
Memoirs on the Blood of Lamna cornubica, &c., by the author, G. Gulliver, Esq., F.R.S.
The Bee Keeper's Magazine (one number only), by Major Munn
Portlock's Geological Report on Londonderry, and part of Tyrone and Fermanagh, by W. Whitaker, Esq., Geological Museum, Jermyn street
Proceedings of the Eastbourne Natural History Society for portions of 1872 and 1873.
A Paper on the Œsophagus, of the Red Hornbill, from G. Gulliver, Esq., F.R.S.
Seven Pamphlets on various subjects, from the Secretary, C. Holst, of the Royal University of Christiana
On the Size of the Red Cerpuscles of the Blood of the Salamander, &c., by the author, G. Gulliver, Esq., F.R.S.
Report of the West Kent Natural History Society for 1872.
List of Works on the Geology, Mineralogy, and Palæontology of the Hampshire Basin, by the author, W. Whitaker, Esq.
Paper on the Apiary, from the late Major Munn.
On the Crystals in the Testa of the Elm and the Character of the Epidermis of the Tway-Blade, by the author, G. Gulliver, Esq., F.R.S.
On the Measurement of the Red Corpuscles of the Blood of Batrachians, by the author, G. Gulliver, Esq., F.R.S.
A Paper from Eastbourne Natural History Society, on a New Fungus, by C. T. Miller, Esq.
A Paper from Ditto on the Orchidaceæ found near Eastbourne, by Miss Hall and Miss A. Woodhouse.
A Paper on Adoxa Moschatellina, by Miss A. Woodhouse.
A Pamphlet on Reminiscences of Animals, Birds, Fishes, and Meteorology, by Thomas Kingsford, Esq., of Canterbury.
Sixth Annual Report of the Eastbourne Natural History Society.
Report of the West Kent Microscopical and Photographic Society.
Pamphlet on the Development of the Hydra Vulgaris, by James Fullagar, Canterbury.
Ninth Report of the Quekett Microscopical Club for the year ending June, 1874.
52 Nos. of "Nature," by G. Rigden, Esq.
7 Pamphlets, by Dr. Wallich, on various subjects.
1 ditto by G. Gulliver, Esq., F.R.S., Review of the Works of Goodsir and other Physiologists.
1 ditto by ditto, On Blood Corpuscles of Batrachians.
1 ditto by ditto, On Spæraphides in Urticaceæ and Leonurus.
1 ditto by ditto, On Blood Corpuscles of the Hippopotamus, Eared Seal and Walrus.
1 ditto by ditto, Sketches of the Spermatozoa of Petromyzon.
Fourth and Fifth Annual Reports of Wellington College Natural Science Society for 1872-3 and 1873-4.

Floral Guide of East Kent, 1839, M. H. Cowell, by J. W. Z. Wright, Esq.,
10 Pamphlets from the University of Christiana.
1 Report of Eastbourne Natural History Society for 1874-5.
Reminiscenses of Animals, Birds, Fishes, and Meteorology, by Thos. Kingsford, Barton House, Canterbury.
The Eighth Annual Report of the Eastbourne Natural History Society.
Eight Pamphlets by Dr. Wallich, on various subjects.
Report and Transactions of the Cardiff Naturalists' Society.
A Pamphlet on the Comparison of the Metamorphosis of the Cranefly and the Blowfly, by the author, Mr. A. Hammond, of Sheerness.

PERIODICALS.

Natural History Review, vol 3, 1863, and vol 4, 1864.
The Zoologist, from 1843 to 1861, and from 1863 to vol. 11, 2nd series, 1876.
N.B.—Zoologist for 1862 is incomplete.
The Quarterly Journal of Microscopical Science, old series, vol. 7, 1859, and vol. 8, 1860, new series, vol. 1, 1861, to vol, 16, 1876, vol. 2, excepted
Magazine of Natural History, third series, vol. 3, 1859, to vol. 8, 1861, and vol. 11, 1863, to vol. 18, 1876
The Geologist, vol. 2, 1852, vols. 3, 4, 6, and 7, 1864
The Phytologist, vol. 3, 1859
The Geological Magazine, vol. 1, 1864, to vol. 3, new series, 1876
Quarterly Journal of Science, vol. 1, 1864, to vol. 6, 1869
Quarterly Journal of the Geological Society, vol. 20, 1864, to vol. 32, 1876
The Natural History Repertory, 1865
The Monthly Journal of the Royal Microscopical Society, vol. 1, 1869, to vol. 14, 1876
"Nature," vols. 12 and 14

THE FOLLOWING PERIODICALS

ARE TAKEN IN BY THE SOCIETY, VIZ.:

1. The Annals and Magazine of Natural History
2. Monthly Microscopical Journal
3. The Zoologist
4. The Geological Magazine
5. Quarterly Journal of the Geological Society
6. Science Gossip
7. The Publications of the Ray Society
8. The Quarterly Journal of Microscopical Science.

The Librarian requests that Members taking Books or Periodicals from the Library will be careful to enter the same in the book kept on the table for the purpose, with the dates, "when borrowed" and "when returned."

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Court, P., Esq.	Dover
Cox, Colonel C. J.	Fordwich House, near Canterbury
Cox, Mrs. C. J.	Ditto
Cole, Mrs.	Castle Street, Canterbury
Crump, Mr. T.	Butter Market, Canterbury
Dean, Mrs.	23, Wincheap, Canterbury
Dover, Right Rev. Bishop of	Precincts, Canterbury
Dowker, G., Esq.	Stourmouth House, Wingham
Farren, Major-General C.B.	Barbadoes
Forrest, Mrs.	Orchard Place, Canterbury
Fullagar, Mr. James	High Street, Canterbury
Furley, R., Esq.	Ashford
Furley, George, Esq.	Barton Villas, Canterbury
Gardner, W., Esq.	Patrixbourne
Gulliver, G., Esq., F.R.S.,	3, Clovis Terrace, Canterbury
Gulliver, G. jun., Esq., B.A.	Ditto

Hammond, W. H., Esq.	Milton Chapel, Canterbury
Hammond, W. O.	St. Alban's Court, Wingham
Harvey, Mr. Sidney	High Street, Canterbury
Hatfeild, Captain C. J.	Hartsdown, Margate
Hillier, J. J., Esq.	4, Chapel Place, Ramsgate
Hilton, Captain	Sole Street, Faversham
Hilton, A. M., Esq.	Ditto
Horsley, Colonel, R.E.	St. Stephen's Lodge, Canterbury
Holden, Mr.	Longport, Canterbury
James, Sir W., Bart.	Betshanger, Sandwich
Johnstone, H. A. Munro-Butler, Esq., M.P.	8, Seamore Place, Mayfair
Kingsford, Montague, Esq.	Littlebourne
Lee, H. Esq., F.L.S., F.G.S.	The Waldrons, Croydon
MacGachen, Rev. N. Howard	St. George's Place, Canterbury
Mackeson, H. B., Esq.	High Street, Hythe
Majendie, L. A., Esq., M.P.	9, Grosvenor Square, London
McDakin, Captain	124, Wincheap, Canterbury
Neame, Miss C.	Orchard Place, Canterbury
Neame, E., Esq.	Harefield, Selling
Neame, Mrs. E.	Ditto
Neame, Miss	St. Dunstan's, Canterbury
Payne-Smith, Very Rev. Dean of Canterbury	Precincts
Payne-Smith, Miss	Ditto
Payne-Smith, Miss J.	Ditto
Peckham, T. G. Esq.	Hall Place, Harbledown
Philpott, W., Esq.	Stone House, St. Martin's Hill
Pittock, Miss	Castle Street, Canterbury
Plumptre, C. J. Esq.	Fredville, Wingham
Poynter, A. Esq.	3, Marine Place, Dover
Powell, Mrs. Thomas	49, London Road
Reid, James, Esq.	Bridge Street, Canterbury
Rigden, G., Esq.	Burgate Street, Canterbury
Rouch, Rev., F.	Precincts, Canterbury
Sankey, Herbert T. Esq.	Burgate Street, Canterbury
Saunders, Sibert, Esq.	Whitstable
Slater, F. T. Esq.	Chislet
Smith, J. G. Esq.	Effingham Lawn, Dover
Sondes, Rt. Hon. Lord	Lees Court, Faversham

Stilwell, James, Esq.	Victoria Park, Dover
Taylor, Mrs. A. M. W.	North Street, Herne Bay
Terry, Mrs.	66, Burgate Street, Canterbury
Thomson, R. E., Esq.	Kenfield House, Petham
Wacher, F., Esq.	King's Bridge, Canterbury
Ward, Miss	High Street, Canterbury
Wareham, Mrs.	Dane John, Canterbury
Welby, Miss	St. Peter's Street
Wetherelt, A., Esq.	66, Burgate Street, Canterbury
Wray, Miss	9, St. George's Place, Canterbury
Wright, J. W. Z., Esq.	Barton Fields, Canterbury
Wright, Dr. J. Hornsby	3, St. George's Fields
Wyatt, Mr. A. G.	Mercery Lane, Canterbury

HONORARY & CORRESPONDING MEMBERS.

Bartlett, A. D., Esq.	Zoological Gardens, London
Bates, H. W., Esq.	London
Bewsher, Charles, Esq.	St. Louis, Mauritius
Boycott, J., Esq., M.D.	London
Britton, J., Esq.	Royal Herbarian, Kew.
Kemp, Dr. William	Wellington, New Zealand
Linford, Mr. J. S.	Charlton, Woolwich
Masters, Dr. Maxwell, T., F.R.S.	Ealing
Mitchinson, Right Rev. Dr.	Bishop of Barbados
Sandilands, —, Esq.	Cannings Down, Queensland, Australia
Saunders, W. Wilson, Esq.	Worthing
Trimen, H., Esq.	Botanical Department, British Museum
Whitaker, W., Esq.	Geological Museum, Jermyn Street, London

ASSOCIATES.

Baker, Mr.	Cattle Market, Sandwich
Coppen, Mr. E.	Sibertswould
Dean, Mr. H.	St. Peter's Street, Canterbury,
Down, Mr.	St. Dunstan's Street, Canterbury
Else, Mr. R.	Burgate Lane, Canterbury
Freeman, Mr. H. E.	48, Woodstock Road, Finsbury Park, London
Gordon, Mr. W. C.	Museum, Dover
Gutteridge, Mr.	Faversham
Hayward, Mr. E. B.	6, Burgate Lane, Canterbury
Kingsford, Mr.	Barton Mills
Kennett, Mr. W.	Fordwich
Kyngdon, Mr.	Margate Bank
Mason, T. G., Esq.	Esplanade, Deal
Parren, Mr. W.	Canterbury
Prebble, Mr. J. G.	Ramsgate
Young, Mr.	Sittingbourne

East Kent Natural History Society.

:o:

TITLE & OBJECTS OF THE SOCIETY.

:o:

The objects of the East Kent Natural History Society shall be the Collection and Diffusion of Practical and Theoretical knowledge respecting Natural History, in all its Branches, both in relation to the particular District and the General Science.

RULES AND REGULATIONS.

MEMBERSHIP.

1. The Society shall consist of Ordinary, Honorary, and Corresponding Members, and of Associates.

2. Every candidate for admission into the Society as an Ordinary Member, must be proposed in writing by two Members, and the election shall be by show of hands or by Ballot, taken at any meeting of the Committee, or at a general meeting—one negative in five votes to exclude.

3. The Annual Subscriptions to be paid by Ordinary Members shall be Ten Shillings ; the Subscriptions shall become due on the 1st of January in each year, and shall be paid in advance for the current year. Any Member neglecting to pay his Subscription for three months after it is due, shall be applied to by the Treasurer or Secretary, and if the Subscription remain unpaid for three months after such application, he shall cease to be a member of the Society.

4. The Committee shall have power to admit, without ballot, on the nomination of two Members, any Lady who shall be desirous of becoming an Ordinary Member, and her Subscription shall be Five Shillings. This rule shall apply also to such sons, brothers, and nephews of Ordinary

Members, as may be regularly residents in the same house with those Members.

5. Any persons distinguished for their researches in Natural History for their liberality to the Society, or for their connection with similar Societies, may, on the recommendation of the Committee, be elected Honorary or Corresponding Members of this Society, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subjected to any of the expenses of the Society, and shall have no vote in its affairs, nor be entitled to take books out of the Library, nor to the Reports and Notices.

6. In order to cultivate the study of Natural History among individuals of the class of Mechanics, &c., residing in the district, the Committee shall have power to admit individuals of that class as Associates, provided they shall first communicate some information or observation on Natural History, exhibit such specimens or present them to the Local Museums, as shall by their merits satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

MANAGEMENT AND BUSINESS MEETINGS.

7. The affairs of the Society shall be conducted by a Committee of Management, which shall consist of a President, Vice-presidents, a Treasurer, and an Honorary Secretary, with not less than six Members, who shall all be chosen at the Annual Meeting. Three Members of such Committee shall form a quorum. The meetings shall be held at four o'clock p,m. on the 1st Saturday in every month, and at such other times as the Secretary may deem necessary. At any regular meeting including a sufficient number of Committee-Members, they may then and there declare themselves and act as a Committee in the ordinary business of the Society

8. An Annual Meeting shall be held at four o'clock p.m., on the last Tuesday in January, in each year, at Canterbury, for the purpose of electing the officers for the current year, receiving the Annual Statement of Accounts, and report of the Committee, and conducting the general affairs of the Society. In case of necessity, the Committee may alter the hour, posting due notice thereof in the Society's room.

9. Special General Meetings may be summoned by the Committee, or by the Secretary, on the requisition (in writing) of any six Members of the Society, the specific purposes of the Meeting being stated in the notice, which shall be sent to each Member not less than one week before the time of such Meeting.

10. All questions discussed at the Meetings shall be decided by a majority of votes; and if upon any question the votes shall be equal, the Chairman of the Meeting shall have the second or casting vote.

11. In the event of any vacancy occurring in the Officers or Committee, between the Annual Meetings, the same shall be filled up by the Committee. The two Members who have been longest thereon, and have attended the fewest meetings thereof, during the preceding year, shall go out by rotation at the Annual Meeting.

12. In order to facilitate the objects of the Society, the Committee shall be empowered to appoint any member a Local Secretary for the town or district he may reside in. Such Local Secretary shall be *ex-officio* a Member of the Committee.

SCIENTIFIC MEETINGS AND EXCURSIONS.

13. The Meetings for Scientific Business shall be at seven o'clock p.m., on the first Thursday of every month at Canterbury; also extra Meetings at such place and time as the Committee shall have posted due notice of in the Society's apartment. Each Member to have the right of introducing a Visitor at these Meetings.

14. There shall be ordinary Excursions on the Afternoon of the day of each Evening Scientific Meeting, and at other times, if the Committee so appoint, time and place to be duly notified in the Society's room by the Committee; and Special Excursions at such times and places as may be approved by the Committee, who shall consider written suggestions of Members on the subject.

15. Minutes of the Proceedings of all Meetings shall be entered by the Secretary in a book kept for that purpose.

16. The Secretary to give seven days' notice of Special Excursions to every Member, stating the time and place, thereof, &c.

LOCAL OR DISTRICT MEETINGS.

17. To promote still further the objects and interests of the Society Local Secretaries and Members are invited to organize Meetings or Excursions in their district; and to give notice of the same to the General and all the Local Secretaries; stating the time and place of Meeting, and what particular subjects are to be brought forward.

COLLECTION OF SPECIMENS.

18. The Society as soon as it may possess sufficient means, shall

endeavour to make a Collection of Objects of Natural History, both with a view of forming a Museum and distribution of Duplicate Specimens according to the Regulations to be adopted by the Committee.

LIBRARY.

19. Only Books and Periodicals connected with Natural History are to be purchased by the funds of the Society, and the number and particular books of this class to be purchased shall be determined by the Committee.

20. All the Books and Periodicals shall be kept in some convenient place, so that Members shall be able to refer to them or take them out under such regulations as the Committee from time to time may think proper to make.

21. Members are also invited to lend Books for the use of the Library, reserving to themselves the full right of ownership; such Books to be under the care of the Committee, and not allowed to be taken out of the Library.

22. In order to allow the Librarian to examine the Books, they must all be returned to the Library and none taken therefrom during the first week in every June.

BRIEF ABSTRACTS OF THE REPORTS OF THE SCIENTIFIC MEETINGS IN 1876.

January 5th.

Mr. F. B. Kyngdon of Margate attended and exhibited a number of beautiful slides, mounted by F. W. Sharpus, Esq., among them a perfect specimen of Ophiocoma neglecta or the common Brittle Ray, (a species of Starfish); also Ambulacral disk of Echinus Sphera, and Gizzard of Cockroach.

Mr. Fullagar continued his observations on the Actrinophrys Sol and exhibited some specimens of Amœba villosa under the Microscope.

February 2nd.

W. Gardner, Esq., of Bekesbourne, brought to the meeting some samples of Wheat, infected by a disease termed Earcockle or purples, caused by a minute worm, Vibrio tritici, belonging to the class Infusoria.

Col. Horsley exhibited under the microscope a dog tick showing the peculiar form of the Spiracles, and a living tick taken from a tortoise, sent to the meeting by Mr. Bateman of St. George's.

March 1st.

Mr. A. Wetherelt exhibited a number of beautifully mounted slides, among which was a fine preparation of the tracheæ of the water-beetle, Dytiscus marginalis. Mr. Fullagar sent a paper on the developement of Tubicolaria Najas, which has been printed in extenso with diagrams and will be furnished to the members with this Report. Mr. S. Harvey laid before the meeting an extensive collection of British Mosses presented to the Society by J. B. Sheppard, Esq., by whom they were collected and arranged, and for which the most cordial thanks of the Society were voted.

April 5th.

The following objects of interest were exhibited to the meeting, viz., a young Salmon, immediately after being hatched, by G. L. Austin, Esq. Living specimens of Palmella, a cryptogam, nearly allied to, if not identical with the red snow of the Polar regions. Also the living ova of Goniodoris Nodosa, from Ramsgate, showing the palate and mantle, and illustrating the character of the Nudibranchiate Molusca. Also a living specimen of the long-eared bat and other objects, by the President, G. Dowker, Esq., F.G.S. Hydra viridis, by Colonel Horsley. A variety of interesting slides, by F. B. Kyngdom, Esq. Larva of the Corethrœa Plumicornis, or phantom larva, by Mr. Jas. Fullagar.

May 3rd.

Specimens of Sphærosira Volvox were exhibted by the President. Mr. Hayward brought a piece of amber containing a dipterous insect in a very perfect state. A cruciform rock crystal was exhibited by Captain McDakin. Mr. Fullager contributed specimens of Hydra viridis which had begun to produce ova. Also some smooth Newts, eight days old, showing the circulation of the blood.

June 7th.

Rev. N. H. McGachen exhibited a beautiful collection of ferns, collected in Assam, India, by Dr. Dickerson, Staff Surgeon, Cavalry Depot. Mrs. Dean brought to the meeting a large collection of British plants in season, from the neighbourhood. Some observations by the Secretary, G. Gulliver, Esq., F.R.S., on Raphides and other plant-crystals and the decay of the trees in Hyde Park, were read to the meeting, in his absence from indisposition. Mr. Sibert Saunders, of Whitstable, displayed under the microscope the ovum of a salt-water fish, species unknown, showing the circulation of the blood around the embryo. Mr. Fullagar exhibited the larva of a gnat in the three forms which it passes through in its metamorphoses. Mr. Hayward produced some good slides of sections of Bird's Eye Maple, of his own mounting. Colonel Horsley shewed a section of sugar cane, fresh from Barbadoes, under the microscope, with the saccharine matter crystalised in the cells.

On June 22nd, a most interesting lecture, illustrated by diagrams, was given by W. Wilson Saunders, Esq., F.R.S., &c., &c., on Seeds, and the way in which they are carried and dis-

persed by the action of air and water, in the King's School, Cathedral Precincts, by the kind permission of Rev. Dr. Blore.

July 5th.

The President displayed specimens of the Lizard Orchis (O Hircina) also the gizzard of the Cockroach and the circulation in a species of Chara. Colonel Horsley brought fine specimens in flower of Anacharis and Vallis neria, the spiral stalk of the latter measuring 30 inches in length, grown in his aquarium. A fine collection of wild flowers in season, including the rare sea heath or Frankenia lævis, was exhibited by Mrs. Dean. Mr. Hammond of Milton Chapel contributed some Mineralogical specimens, among which were polished pebbles shewing internal structure.

Examples of fossil wood from the lower green sand, selenite from gault clay and ammonites falcatus, also from gault by Captain McDakin.

August 2nd.

Col. Horsley in reference to some remarks from the President about the shifting habitats of Polyzoa that it had come to his knowledge that Plumatella repens had taken up its abode in the rain water butt at Mr. Dean's, St. Peter's Street, Canterbury, specimens of which he exhibited at the meeting. Also the starry scales from the under side of the leaf of an "Alœagnus." Mr. Fullagar exhibited several specimens of the wonderful little boats of eggs of the common gnat (Culex Pipiens). He also shewed under the microscope the crystals from the common Cuckoo plant, Aram maculatum; according to Professor Gulliver's researches this order is remarkable for its richness in raphides. W. Gardner, Esq., sent some specimens of the red spider which infests the hop plants. Also of the larva of the lady bird, that friend to the hop growers and enemy to the destructive aphis. Mrs. W. Clements brought specimens of the Deptford Pink in bloom.

September 6th.

Mr. A. Hammond, Sheerness, displayed some foraminifera, from the London clay of the Isle of Sheppy, obtained from the depth of 150 to 200 feet, where they occur in thin layers of not more than half-an-inch thick. Captain McDakin exhibited specimens of the well known coloured sands, from Alum Bay, in the Isle of Wight. Colonel Horsley drew attention to the

peculiarity of the flowers of the Common Lythrum which consisted in the fact that in many instances the six long stamens were surmounted with purple anthers containing green pollen while the six shorter ones have yellow anthers with bright yellow pollen. Moreover, the size of the pollen differed, the green measuring 1-600th of an inch long by 1-1200th broad, while the yellow is 1-800th long by 1-1600th broad. The attention of local botanists was requested to the further investigation of this subject. Mr. Fullagar exhibited living specimens of the Canterbury Argus reflexus, which have been frequently reverted to in former reports. Mr. Bell brought for inspection a specimen of fossil fruit, from the London clay, near Whitstable.

October 4th.

Mr. W. H. Hammond exhibited a goodly collection of slides, which he had mounted, principally fresh water diatoms from Chartham. Mr. Kingsford, of Wingham, sent a large specimen of the tree or paper wasp, constructed on a branch of holly. A paper was read from Major Hall, of Exeter, a corresponding member of the Society, on "Physianthus albens," the flower of which entraps and kills large insects.

November 1st.

W. Gardner, Esq., sent to the meeting large specimens of the fruit of Pyrus Japonica. Mr. W. H. Hammond exhibited a variety of polished pebbles from Devonshire. Mrs. Collins from St. Martin's Hill, contributed a number of the parasites of the large humble bee. A further description by Major Hall of the insect trapping plant, Physianthus albens, an Asclepiad, was read at the meeting, and a vote of thanks was accorded him for both his interesting papers on this subject. An historical introduction was given by the Hon. Sec., and some important remarks on the above papers were made by James Reid, Esq., which will be found in the Society's Record.

A special meeting was held on the 23rd November at the Society's rooms when the President, G. Dowker, Esq., F.G.S., gave a lecture on flint stones with an account of banded flints. The lecture was illustated by diagrams and by a large number of specimens from the President's private collection. The solubility of Silica was stated to be of the highest interest to the Geologist, and one method in which the gelatinous silica was seen forming drop by drop was most successfully demonstrated during the lecture by Mr. Sidney Harvey, who afterwards explained the apparatus and process used.

December 6th.

Captain McDakin exhibited a collection of New Zealand ferns lent for the occasion by Mrs. Tassell of St. Dunstan's, which were very much admired, alike for their beauty and manner of mounting. Mr. Wetherelt shewed under the Microscope a variety of spores in their cases of our own ferns. Mr. Fullagar exhibited a small portion of living fresh water sponge, Spongilla fluviatilis, under the microscope and with the assistance of a well executed diagram explained the manner of the circulation of the water through the cavities thereof.

Further observations on this interesting subject were promised at a future meeting.

EAST KENT NATURAL HISTORY SOCIETY.

MEETINGS 1877-78.

SCIENTIFIC on THURSDAYS, at 7 o'clock.

March	1, 1877
April	5, ,,
May	3, ,,
June	7, ,,
July	5, ,,
August	2, ,,
September	6, ,,
October	4, ,,
November	7, ,,
December	6, ,,
January	3, 1878
February	7, ,,
March	7, ,,
April	4, ,,

N.B.—The Committee meet on the Saturday next following the date of the Scientific Meeting in each month.

ANNUAL MEETING,

TUESDAY, JANUARY 29, 1878, at 4 o'clock p.m.

Twentieth Report

OF THE

EAST KENT

NATURAL HISTORY SOCIETY,

ADOPTED AT THE

Annual Meeting,

Held at Canterbury on January 29th, 1878.

CANTERBURY:

PRINTED AT THE "KENTISH GAZETTE" OFFICE, HIGH-STREET.

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CONTENTS.

EAST KENT NATURAL HISTORY SOCIETY.

REPORT OF THE COMMITTEE FOR 1877.

Your Committee regret to have to state that the serious and long protracted illness of the President as well as of the Honorary Secretary and Honorary Assistant Secretary has delayed the compilation of the Report for the past year. But the delay has enabled your Committee to draw up a more detailed account of the scientific proceedings than usual, as may be seen in the following pages—thus the members will have a more perfect retrospect of the scientific meetings than has been hitherto given. A complete record of them is kept by the Honorary Assistant Secretary (Mr. Fullagar) in a book, which is open to all the members. Notwithstanding some impediments the Society maintains its ground. There are at the present time 93 members, six of whom were added to the list during the year 1877. The total expenditure during that year was £40 16s. 7d., inclusive of £11 12s. 7d. paid to the Librarian, all of which is given in detail in the financial statement. The arrears of subscriptions at the present time amount to £15 5s. The receipts from subscriptions in the year 1877 were £29 5s. 6d., to which must be added £14 5s., arrears of previous years, collected by the Honorary Treasurer in that year, making a total of £43 10s. 6d., and leaving a balance in favour of the Society on the 1st January, 1878, of £2 13s. 11d. It is earnestly requested that those members who are still in arrears with their subscriptions will remit them to the Treasurer at their earliest convenience, as the funds are at present very low.

Your Committee hope that the steps taken in the Society may be of some use in preventing the extirpation of rare plants and animals, and in promoting the better management of provincial museums. Both these points are receiving increased attention; and the latter will have more should Mr. Mundella's motion on the subject, of which notice has been given, be entertained in the next Session of the House of Commons.

The scientific transactions of the Society are in the present Report so extended that they may be left to tell their own tale,

without comment of the Committee. The usual excursions in the neighbourhood of Canterbury and to the coast at Whitstable took place, though with but few members present, and the collections both of fauna and flora then and there made were exhibited at the monthly scientific meetings.

Mr. Dowker having invited the members of the Society to his place at Stourmouth, in August, they were cordially entertained by his hospitality, and interested and instructed by a variety of objects, including several specimens of pond life. Thus a very pleasant and profitable day was spent by a large number of members—and that is but one among many instances in which this gentleman has shown a personal interest in the welfare of the Society, both in its social and scientific bearings. In short, the transactions of the Society will show how often it has to thank him for his zeal and interest in the good cause.

Your Committee feel that the cordial thanks of the Society are due to its officers ; to the Right Rev. the Bishop of Dover, President; to G. Gulliver, Esq., F.R.S., Hon. Secretary, who though laid aside by illness, and at times suffering acute pain, nevertheless is always ready to render his valuable assistance to any member of the Society requiring help in the study of Natural History; also to the Hon. Assistant Secretary; to the Hon. Treasurer and Librarian; and to Mr. Rigden for his kindness in auditing the accounts.

The thanks of the Society are also due to James Reid, Esq., Captain McDakin, Mr. W. H. Hammond, Mr. Sidney Harvey, and Mr. Sibert Saunders, for the effectual help rendered by them in the scientific business of the Society.

REPORT OF THE LIBRARIAN FOR 1877.

The amount at the disposal of the Librarian for the purchase of books, &c., in the year under review was £13 8s. 8d., consisting of a balance of £1 16s. 1d. from the previous year, and a grant of £11 12s. 7d. from the general fund of the Society. Of this sum £5 6s. were laid out in the purchase of new books, a list of which is given below, and £6 5s. 1d. for periodicals. A further sum of £1 12s. 1d. was expended in binding 13 vols. of the previous year's periodicals, and 2s. in the carriage of books and postage, leaving a balance of 3s. 6d. in hand.

The Society's funds being at a very low ebb, the Librarian refrained from calling upon the Hon. Treasurer for the usual grant of £15, and this accounts for the comparatively small sum spent on new books in 1877. Those purchased consist of the following, viz. :—

Knapp's Journal of a Naturalist.
Leach's Zoological Miscellany.

Smith's East Kent Flora
Wallace, G., Distribution of Mammals, 2 vols., 8vo.
Wallace, G., Malay Archipelago, 2 vols., 8vo.
Swainson's Birds, 2 vols, 12mo.
Wyville Thompson's, Second Voyage of the "Challenger," 2 vols., 8vo., 1876.

The Society has not received any work from the Ray Society in return for the annual subscription of one guinea. In reply to his inquiry, the Secretary, Rev. Thomas Wiltshire, informs the Librarian that he "rather thinks that before the next annual meeting I shall be able to issue the 1876 and 1877 vols." The last issue was that for 1875, mentioned in last report.

The following pamphlets, &c., were presented to the Society during 1877, viz.:—

On the Skeleton of an Extinct Gigantic Sloth, Mylodon Robustus, by Owen. Also 24 Microscopic Slides, presented by Dr. Mason, Deal.
Sixth Report and Abstract Proceedings of the Croydon Microscopical Club.
Report of the Council of the Zoological Society of London, 1877.
Sixth Annual Report of the Wellington College Natural Science Society, 1875.
The Insect Hunter's Companion, presented by Miss L. Brown.
Pamphlet on the Structure of the Red Blood Corpuscles, &c., by W. H. Hammond, Esq.

FINANCIAL STATEMENT, 1877.

RECEIPTS.

	£	s.	d.
Subscriptions for 1877	29	5	6
Arrears for previous years paid in 1877	14	5	0
	£43	10	6

EXPENDITURE.

	£	s.	d.
Deficit on 31st December, 1876	0	3	9
Rent of Room, No. 6, High-street, for one year	15	0	0
Furniture for New Room	3	10	9
Table for ditto	1	0	0
Fire Insurance on Library and Instruments	0	7	5
Hon. Assistant for Petty Cash and Sundries	1	15	3
Contributions to Library	11	12	7
Ward, for Printing Reports, &c.	6	3	0
Subscriptions to Ray Society	1	1	0
Posting, &c., by Hon. Treasurer	0	2	10
Balance on 1st January, 1878	2	13	11
	£43	10	6

W. H. HORSLEY, Colonel,
Hon. Treasurer.
Canterbury, 25th January, 1878.

Examined and found correct, January 25th, 1878.
GEORGE RIGDEN.

LIST OF BOOKS AND PERIODICALS.

Belonging to the East Kent Natural History Society.

British Land and Fresh Water Molluscs, 1 vol. (Reeve)
Bryologia Britannica, 1 vol. (Wilson)
Synopsis of British Sea Weeds, 1 vol. (Harvey)
Flora of Surrey, 1 vol. (J. A. Brewer)
Manual of Geology, 1 vol. (Professor Phillips)
Flora of East Kent, 1 vol.
Morris's British Butterflies, 1 vol.
Ramsay's Physical Geography of Great Britain, 1 vol.
Dallas's Animal Kingdom. 1 vol.
Johnstone's British Zoophytes, 2 vols.
A Catalogue of Rare Phænogamous Plants collected in South Kent in 1829.
Memoirs of the Geological Survey of Great Britain, 2 Nos. referring to sheets 4 and 7
British Hemiptera, Heteroptera, 1 vol. 1865 (Douglas and Scott.)
Hand Book of British Flora, 2 vols. (Bentham)
Miscellaneous Botanical Works of Robert Brown, 3 vols.
Recent Memoirs on the Cetacea, 1 vol.
Monograph of British Spongiadæ, by Dr. Bowerbank, 2 vols.
Conybeare and Phillips' Geology, 1 vol.
Bell's British Quadrupeds, 1 vol.
Atlas of British Sea Weeds drawn by Mrs. Gatty from Professor Harvey's Phycologia Britannica, 1 vol.
Couch's Fishes, 4 vols.
Forbes' British Star Fishes, 1 vol.
Owen's Comparative Anatomy, 3 vols.
Kirby's British Bees, 2 vols.
Smith's English Flora, 4 vols.
Ralf's Desmidiæ, 1 vol.
Nitzch's Pterylography
Hooker's Jungermanniæ, 1 vol.
Smith's Diatomaceæ, 2 vols.
Works of W. Hewson, F.R.S., 1 vol., edited by G. Gulliver, F.R.S.
Parker's Structure and Development of the Shoulder Girdle and Strenum in the Vertebrata, 1 vol.
Lyell's Principles of Geology, 10th edition, 2 vols.
Masters' Vegetable Teratology, 1 vol.
Bevan on the Honey Bee, edited by Major Munn, F.R.H.S., 1 vol.
Gosse's Marine Zoology 2 vols.
Haughton's Three Kingdoms of Nature, 1 vol.
Westwood's Modern Classification of Insects, 2 vols., 8vo.
Rymer Jones' Outlines of Organization of Animal Kingdom, 1 vol.
Quekett's Lectures on Histology, &c., 2 vols.
A Monograph of the Gymnoblastic or Tubularian Hydroids, by G. J. Allman, M.D., parts 1 and 2
Pulteney's Progress of Botany in England
Pulteney's Account of the Life and Writings of Linnæus
Berkeley's Cryptogamic Botany
Pritchard's History of Infusoria
Baird's Entomostraca Ray Society
Siebold on Parthenogenesis
Barclay on Life and Organization
Capenter's Comparative Physiology
Micrograhpic Dictionary, with plate, 2 vols. (New Edition)
Loudon's Encyclopædia of Plants, with 2 supplements
Kirby and Spence's Introduction to Entomology, 4 vols.
Allman's Freshwater Polyzoa } Bound in 1 vol.
Burmeister's Trilobites }
Treasurer of Botany, 2 vols., by Lindey and Moore

Darwin's Cirripedia Ray Society, vols. 1 and 2
Williamson's Recent Foraminifera, vol. 1
Leighton's Lichen Flora British, vol. 1
Henfrey's Elementary Botany, 2nd edition, by Dr. Masters, F.R.S.
Clarke's Common Sea Weeds
Reports on Zoology, for 1843 and 1844, Ray Society
Bates' Phasmidæ (pamphlet)
Lubbock's Chlœone (ditto)
On Preparing and Mounting Microscopic Objects
Oceanic Hydrozoa, by Huxley, crown folio, 1859
British Annelidsby, W. C. McIntosh, M.D. crown folio, part 1, 1873
Ditto by ditto, The Nemerteans, part 1 continued, 1874
Larmark's Shells by Hanley, 8vo.
Manual of Land and Fresh Water Shells, by Turton, Dr. W.
Book of Birds, Cassell's, 1 vol., 4to.
World of the Sea, translated from the French by Rev. H. Martyn Hart, royal 8vo., 1869
British Sea Anemones, by Gosse, royal 8vo.
Butterflies of Great Britian, by J. O. Westwood, crown 4to., 1855.
British Spongiadæ, Bowerbank, vol. 3, royal 8vo., 1874
British Mosses, by Berkeley, royal 8vo., 1863
British Insects, by Staveley, demy 8vo., 1871
Faversham Plants, Jacob's, royal 12mo., 1777
Common Shells of Sea Shore, by Wood, foolscap 8vo., 1865.
Carpenter's Foramenifera, (Ray Society)
Newman's Moths and Butterflies
Evelyn's Silva
Swan's Nervous System
Berkeley's Fungology
Monro's Structure of Fishes
Curtis on Farm Insects
Essays, by Wells, with Memoir of his Life, 8vo., 1 vol., 1818
British Confervæ, by Dillwyn, 1 vol., 4to., 1809
Natural History of the Polype, by Baker, 1 vol., 8vo., 1743
Monographia Anoplurorum Britanuiæ, by Denny, 1 vol., 8vo., 1842
British Naked Eyed Medusæ, by Prof. E. Forbes, 1 vol., 4to., Ray Society, 1848
The Depths of the Sea, by Wyville Thompson, 1 vol., 8vo., 1873
Evenings at the Microscope, by Gosse, 1 vol.. 8vo., 1859.
Natural History and Antiquities of Selborne, by Gilbert White, edited by E. T. Bennett, with additional notes, by James E. Harting, F.L.S., &c., 1 vol. oyal 8vo., 1875
English Entomologist, by T. Martyn, 1 vol., 4to., 1792
British Butterflies and their Transformations, by Westwood and Humphreys, 1 vol., 4to., 1841
Insectiverous Plants, by Darwin, 1 vol., 8vo., 1875
Monograph of the British Aphides, by G. B. Buckton, vol. 1, 8vo., 1876, Ray Society.
Knapp's Journal of a Naturalist
Leach's Zoological Miscellany
Smith's East Kent Flora
Wallace, G., Distribution of Mammals, 2 vols., 8vo.
Wallace, G., Malay Archipelago, 2 vols., 8vo.
Swainson's Birds, 2 vols., 12mo.
Wyville Thompson's Second Voyage of the Challenger, 2 vols., 8vo., 1876

PAMPHLETS.

British Moths, Nocturni
,, Geometræ
Memoirs pour servir a la connaissance des Criniodes vivants, par Michael Sars
Etudes sur les Affinites Chimiques, par MM. Guldberg et Waage

Notes on Lemnaceæ and the Raphidian Character of Plants, by G. Gulliver, F.R.S.
Sketches to a Scale of the Auditory Organs of Molluscs, by G. Gulliver, F.R.S.
On the Muscular Sheath of the Œsophagus of the "Aye, Aye," (Chiromys Madagascariensis), by G. Gulliver, F.R.S.
On the Fibres of the Crystalline Lens of the Petromyzonini, by G. Gulliver, F.R.S.
The Diatom Prism and the true form of Diatom Markings. The Microscope Prism and the Structure of the Podura Scales, by the Rev. J. B. Reade, F.R.S.
Le Glacier de Boinon per Mons. S. A. Saxe.
On a Fern-stem (Osmundites Dowkeri) from the Eocine of Herne Bay, by Mr. Carruthers
On the Chalk of Thanet and East Kent, by G. Dowker, F.G.S.
On the Œsophagus of Sauropsida and other Vertebrata, by G. Gulliver, F.R.S.
On the Red Corpuscles of the Blood of Moschus, Tragulus, and Orycteropus, by G. Gulliver, F.R.S.
Crustacea Amphipoda Borealia et Arctica, by Axel Boeck
Phanerogamer og Bregner, by A. Blytt (from the Royal University of Norway)
Third Annual Report of the Folkestone Natural History Society for 1871
First Report of the Proceedings of the Folkestone Microscopical Club for 1871
Third Annual Report of the Eastbourne Natural History Society for 1871
West Kent Natural History Society's Report for 1871
Ten Papers by the late George Newport, F.R.S., extracted from the Transactions of the Royal and Linnæan Societies; presented by Mr. R. J. Bell, St. Margaret's Street, Canterbury, bound in one volume
Memoirs on the Blood of Lamna Cornubica, &c., by the author, G. Gulliver, Esq., F.R.S.
The Bee Keeper's Magazine (one number only), by Major Munn
Portlock's Geological Report on Londonderry and part of Tyrone, and Fermanagh, by W. Whitaker, Esq., Geological Museum, Jermyn-street.
Proceedings of the Eastbourne Natural History Society for portions of 1872 and 1873
A paper on the Œsophagus of the Red Hornbill, from G. Gulliver, Esq., F.R.S.
Seven Pamphlets on various subjects, from the Secretary, C. Holst, of the Royal University of Christiana
On the Size of the Red Corpuscles of the Blood of the Salamander, &c., by the author, G. Gulliver, Esq., F.R.S.
Report of the West Kent Natural History Society for 1872
List of Works on the Geology, Mineralogy, and Palæontology of the Hampshire Basin, by the author, W. Whitaker, Esq.
Paper on the Apiary, from the late Major Munn
On the Crystals in the Testa of the Elm and the Character of the Epidermis of the Tway-Blade, by the author, G. Gulliver, Esq., F.R.S.
On the Measurement of the Red Corpuscles of the Blood of Batrachians, by the author, G. Gulliver, Esq., F.R.S.
A Paper from the Eastbourne Natural History Society, on a New Fungus, by C. T. Miller, Esq.
A Paper from ditto on the Orchidaceæ found near Eastbourne, by Miss Hall and Miss A. Woodhouse
A Paper on Adoxa Moschatellina, by Miss A. Woodhouse
A Pamphlet on Reminiscences of Animals, Birds, Fishes, and Meteorology, by Thomas Kingsford, Esq., of Canterbury
Sixth Annual Report of the Eastbourne Natural History Society
Report of the West Kent Microscopical and Photographic Society
Pamphlet on the Development of the Hydra Vulgaris, by James Fullagar, Canterbury
Ninth Report of the Quekett Microscopical Club for the year ending June, 1874
52 Nos. of "Nature," by G. Rigden, Esq.
Seven Pamphlets, by Dr. Wallich, on various subjects
One ditto by G. Gulliver, Esq., F.R.S., Review of the Works of Goodsir and other Physiologists
One ditto by ditto on Blood Corpuscles of Batrachians
One ditto by ditto on Spæraphides in Urticaceæ and Leonurus

One ditto by ditto On Blood Corpuscles of the Hippopotamus, Eared Seal and Walrus.
One ditto by ditto, Sketches of the Spermatozoa of Petromyzon.
Fourth and Fifth Annual Reports of Wellington College Natural Science Society for 1872-3 and 1873-4.
Floral Guide of East Kent, 1839, M. H. Cowell, by J. W. Z. Wright, Esq.
Ten Pamphlets from the University of Christiana.
One Report of Eastbourne Natural History Society for 1874-5.
Reminiscences of Animals, Birds, Fishes, and Meteorology, by Thos Kingsford, Barton House, Canterbury.
The Eighth Annual Report of the Eastbourne Natural History Society.
Eight Pamphlets by Dr. Wallich, on various subjects.
Report and Transactions of the Cardiff Naturalists' Society.
A Pamphlet on the Comparison of the Metamorphosis of the Cranefly and the Blowfly, by the author, Mr. A. Hammond, of Sheerness.
On the Skeleton of an extinct Gigantic Sloth, Mylodon Robustus, by Owen
Sixth Report and Abstract of Proceedings of the Croydon Microscopical Club
Report of the Council of the Zoological Society of London, 1877
Sixth Annual Report of the Wellington College Natural History Society, 1875
The Insect Hunter's Companion, presented by Miss L. Brown
Pamphlet on the Structure of the Red blood Corpuscles, &c., by W. H. Hammond, Esq.

PERIODICALS.

Natural History Review, vol. 3, 1863, and vol. 4, 1864.
The Zoologist, from 1843 to 1861, and from 1863 to vol. 11, 2nd series, 1876.
N.B.—Zoologist for 1862 is incomplete.
The Quarterly Journal of Microscopical Science, old series, vol. 7, 1859, and vol. 8, 1860, new series, vol. 1, 1861, to vol. 16, 1876, vol. 2 excepted.
Magazine of Natural History, third series, vol. 3, 1859, to vol. 8, 1861, and vol. 11, 1863, to vol. 18, 1876.
The Geologist, vol. 2, 1852, vols. 3, 4, 6, and 7, 1864.
The Phytologist, vol. 3, 1859.
The Geological Magazine, vol. 1, 1864, to vol. 3, new series, 1876
Quarterly Journal of Science, vol. 1, 1864, to vol. 6, 1869
Quarterly Journal of the Geological Society, vol. 20, 1864, to vol. 32, 1876
The Natural History Repertory, 1865
The Monthly Journal of the Royal Microscopical Society, vol. 1, 1869, to vol. 14, 1876
"Nature," vols. 12 and 14

THE FOLLOWING PERIODICALS

ARE TAKEN IN BY THE SOCIETY, VIZ.:

1. The Annals and Magazine of Natural History
2. The Zoologist
3. The Geological Magazine
4. Quarterly Journal of the Geological Society
5. Science Gossip
6. The Publications of the Ray Society
7. The Quarterly Journal of Microscopical Science.

The Librarian requests that Members taking Books or Periodicals from the Library will be careful to enter the same in the book kept on the table for the purpose, with the dates, " when borrowed " and " when returned."

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East Kent Natural History Society.

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TITLE & OBJECTS OF THE SOCIETY.

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The objects of the East Kent Natural History Society shall be the Collection and Diffusion of Practical and Theoretical knowledge respecting Natural History, in all its Branches, both in relation to the particular District and the General Science.

RULES AND REGULATIONS.

MEMBERSHIP.

1. The Society shall consist of Ordinary, Honorary, and Corresponding Members, and of Associates.

2. Every candidate for admission into the Society as an Ordinary Member, must be proposed in writing by two Members, and the election shall be by show of hands or by Ballot, taken at any meeting of the Committee, or at a general Meeting—one negative in five votes to exclude.

3. The Annual Subscriptions to be paid by Ordinary Members shall be Ten Shillings; the Subscriptions shall become due on the 1st of January in each year, and shall be paid in advance for the current year. Any Member neglecting to pay his Subscription for three months after it is due, shall be applied to by the Treasurer or Secretary, and if the Subscription remain unpaid for three months after such application, he shall cease to be a member of the Society.

4. The Committee shall have power to admit, without ballot, on the nomination of two Members, any Lady who shall be desirous of becoming an Ordinary Member, and her Subscription shall be Five Shillings. This rule shall apply also to such sons, brothers, and nephews of Ordinary

Members, as may be regularly residents in the same house with those Members.

5. Any persons distinguished for their researches in Natural History, for their liberality to the Society, or for their connection with similar Societies, may, on the recommendation of the Committee, be elected Honorary or Corresponding Members of this Society, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subjected to any of the expenses of the Society, and shall have no vote in its affairs, nor be entitled to take books out of the Library, nor to the Reports and Notices.

6. In order to cultivate the study of Natural History among individuals of the class of Mechanics, &c., residing in the district, the Committee shall have power to admit individuals of that class as Associates, provided they shall first communicate some information or observation on Natural History, exhibit such specimens or present them to the Local Museums, as shall by their merits satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

MANAGEMENT AND BUSINESS MEETINGS.

7. The affairs of the Society shall be conducted by a Committee of Management, which shall consist of a President, Vice-presidents, a Treasurer, and an Honorary Secretary, with not less than six Members, who shall all be chosen at the Annual Meeting. Three Members of such Committee shall form a quorum. The meetings shall be held at four o'clock p.m. on the 1st Saturday in every month, and at such other times as the Secretary may deem necessary. At any regular meeting including a sufficient number of Committee-Members, they may then and there declare themselves and act as a Committee in the ordinary business of the Society.

8. An Annual Meeting shall be held at four o'clock p.m., on the last Tuesday in January, in each year, at Canterbury, for the purpose of electing the officers for the current year, receiving the Annual Statement of Accounts, and report of the Committee, and conducting the general affairs of the Society. In case of necessity, the Committee may alter the hour, posting due notice thereof in the Society's room.

9. Special General Meetings may be summoned by the Committee, or by the Secretary, on the requisition (in writing) of any six Members of the Society, the specific purposes of the Meeting being stated in the notice, which shall be sent to each Member not less than one week before the time of such Meeting.

10. All questions discussed at the Meetings shall be decided by a majority of votes; and if upon any question the votes shall be equal, the Chairman of the Meeting shall have the second or casting vote.

11. In the event of any vacancy occuring in the Officers or Committee, between the Annual Meetings, the same shall be filled up by the Committee. The two Members who have been longest thereon, and have attended the fewest meetings thereof, during the preceding year, shall go out by rotation at the Annual Meeting.

12. In order to facilitate the objects of the Society, the Committee shall be empowered to appoint any Member a Local Secretary for the town or district he may reside in. Such Local Secretary shall be *ex-officio* a Member of the Committee.

SCIENTIFIC MEETINGS AND EXCURSIONS.

13. The Meetings of Scientific Business shall be at seven o'clock p.m., on the first Wednesday of every month at Canterbury; also extra Meetings at such place and time as the Committee shall have posted due notice of in the Society's apartment. Each Member to have the right of introducing a Visitor at these Meetings.

14. There shall be ordinary Excursions on the Afternoon of the day of each evening Scientific Meeting, and at other times, if the Committee so appoint, time and place to be duly notified in the Society's room by the Committee; and Special Excursions at such times and places as may be approved by the Committee, who shall consider written suggestions of Members on the subject.

15. Minutes of the proceedings of all Meetings shall be entered by the Secretary in a book kept for that purpose.

16. The Secretary to give seven days' notice of Special Excursions to every Member, stating the time and place thereof, &c.

LOCAL OR DISTRICT MEETINGS.

17. To promote still further the objects and interests of the Society Local Secretaries and Members are invited to organize Meetings or Excursions in their district; and to give notice of the same to the General and all the Local Secretaries; stating the time and place of Meeting, and what particular subjects are to be brought forward.

COLLECTION OF SPECIMENS.

18. The Society as soon as it may possess sufficient means, shall

endeavour to make a Collection of Objects of Natural History, both with a view of forming a Museum and distribution of Duplicate Specimens according to the Regulations to be adopted by the Committee.

LIBRARY.

19. Only Books and Periodicals connected with Natural History are to be purchased by the funds of the Society, and the number and particular books of this class to be purchased shall be determined by the Committee.

20. All the Books and Periodicals shall be kept in some convenient place, so that Members shall be able to refer to them or take them out under such regulations as the Committee from time to time may think proper to make.

21. Members are also invited to lend Books for the use of the Library, reserving to themselves the full right of ownership; such Books to be under the care of the Committee, and not allowed to be taken out of the Library.

22. In order to allow the Librarian to examine the Books they must all be returned to the Library and none taken therefrom during the first week in every June.

Brief Abstracts of the Reports of the Scientific Meetings in 1877.

November 23, 1876.

A special meeting was held on Thursday, Nov. 23. The President, G. Dowker, Esq., F.G.S., gave a lecture on Flint Stones, with an account of Banded Flints. The lecture was illustrated by diagrams, and also by a large number of specimens from the President's private collection. Colonel Horsley occupied the chair, and there was a large attendance of members and visitors.

Mr. Dowker commenced by alluding to the common prevalence of flints, especially in this part of England. The roads were made of them, the fields strewn with them, and the shore covered by them. Their various forms, and the impressions often on them, would furnish thoughts and speculations to the most casual observer, none perhaps more frequent than that relating to their origin and nature. Though many theories on their casual origin had been started and abandoned, the subject still was an unsettled one. Locally, all were derived from the chalk where flint would be found in scattered *nodules*, or with the nodules arranged in horizontally extended layers placed one above the other at regular distances, or sometimes in compact continuous layers, *tabulor flint*, and lastly as thin veins or layers passing obliquely or perpendicularly across the plane of the bedding of the chalk.

He then reviewed the various theories of the origin of flint.

That of the earliest geologists who assumed the deposit of chalk and flint by chemical affinity from calcareous and silicious solutions in hot springs pouring into the colder water of the ocean. Then in 1840 Mr. Bowerbank started a new theory. Finding, from careful and extensive examination of nodular and tabular flints in thin sections under the microscope, appearances of structures resembling that of recent sponges, he became convinced that all flints were in fact silicified sponges. These observations have been so often quoted and the theory so warmly advocated by many observers, the reputation of their author as a microscopical observer, and his knowledge of sponge, were so great, that Mr. Dowker gave more than a passing notice to his memoirs. Traces of the substantial forms of bodies resembling sponges, with spiculæ, xanthidiæ, foraminifera, and other detained fragments were found in all flints, nodular, tabulæ, or infiltrated, as in Echini and fossils. Even where no traces of sponge structure could be determined, the mode in which the spiculæ and other extraneous matter are dispersed equally in all parts and not precipitated in a lump, indicates that the organic tissue which enclosed them retained its form sufficiently to allow of their fossilization in their original places. Further, by a cruder examination of the surfaces of the nodular flints resemblances to sponge were found. In the perpendicular and oblique veins of flints, when occasional fissures filled with chalk occurred between the laminœ, it was conceived that the sponge had grown from the two sides of the crevice but had not coalesced. In the cherts of the greensand the sponge fibre was of a coarser texture than that of a chalk flint. The animal matter of the sponge was the active agent in determining the deposit of flint, and operated equally through the whole of the body, the analagous action being found in the attractive influence of animal and vegetable substances in forming certain pyritous fossils in London, Kimmeridge, and Oxford clays. Moss-agates and Jasper when examined gave similar evidence of organic origin

Mr. G. W. Hawkins Johnson in a paper read before the Geological Association, 1874, advocates the organic nature of flint; without committing himself to defining the character of the organisms, he believed them to have abounded in proto-plasm permeated by innumerable branching and inosculating canals. This animal tissue having an affinity for Silica parted with its carbon which was replaced by Silicon, the process commencing immediately after the death of the organism. By a particular process fully described by Mr. Dowker, flints and other bodies in which Mr. Johnson found his basic organism, as the Septaria of Clays, Coprolites of the green sand, and Pyritic nodules of the chalk, were so disintegrated as to leave in relief the arbores-

cence of these organic tracings. Several beautiful diagrams illustrated this part of the paper.

That many flints are sponges or organic structures, permeated with silex, is very evident, but to endeavour to account for the formation of flint entirely on a theory of organic origin cannot be received as satisfactory. Any theory to be complete must explain all the facts in connection with the presence and appearance of flint. No hypothesis of the organic origin of flint sufficiently explains the oblique tabular layers of flint which pass through beds of chalk that must have taken ages to attain their great thickness, for sponge, &c., could not grow in one succession for these countless ages; the re-cementing with silicious matter, fractured and displaced surfaces of crushed flints; the banded structure of some flints resembling onyx; or the chalcedonic structure filling cavities.

Mr. Dowker then explained in much detail these several conditions of flint alluded to, quoting from the papers of Woodward, Wetherell, Tomlin Smith, and his own, and illustrating them from the abundant excellent specimens on the table. Our limits will not permit us to do full justice to these remarks. In none of these varied states did organic structure appear to be more than accidentally present. The *banded flints* presented alternate dark and white bands, generally arranged at right angles to a given axis, when exposed to weather these bands resist unequally, the softer wearing away and giving a ribbed appearance to the stone, the ridge forming more or less complete circles. These coloured bands, for they do not appear to be always white, are due to infiltration. Flints are known to be porous and to freely absorb fluids from without, thus they are specially liable to become stained with the colour of iron or chalk dissolved in such fluids. The white, the yellow, and the green coats extending to some depth are due to this. and, from all parts not being equally porous, the tracings of organic structure are often distinctly defined by the absorption of these coloured fluids from without and their arrest around the structure. This banded appearance is not confined to nodular flints but was also found in the vertical tabular layers of flint. At the junction of the Tertiary Beds with the chalk in Kent, remarkable *recemented flints* are often met with. They present many fractures that have been reunited with silicious matter, the surfaces often having shifted and joined in a new position. In some cases between the surfaces intervenes a layer of white coated flint. Various casts of fossils found in the chalk occur, as Ananchites, Spatangus, Cidaris, Galerites, Lima, and Ventriculites, presenting the features of the original surface of the fossil, and most wonderfully preserving all the delicate markings. This flinty substance not only filled

the original cavity, but appears to have flowed out and hardened as molten lead from the opening of a bullet mould. Flints are found with cavities partially filled with quartz crystals, chalcedony of mammilated structure or both combined, when the transition from opaque flint to chalcedony and clear crystal can be traced. Not only was the presence of sponges inadequate to account for these conditions of flint, but it must be borne in mind that a great portion of the chalk is entirely destitute of flint, though the remains of sponges and organic bodies were abundantly found in it.

What then is flint? It is nothing more than *altered chalk*, or chalk in which the carbonate of lime is replaced by Silica. It will be necessary to go to the Chemist, not only to show this is probable, but that it has been demonstrated. This process of silicification is not that instantaneous process it is imagined by some, but for the most part a slow process, one, moreover, which is going on at present. The chemical history of Silica was then given in more detail than can be conveniently reproduced here. Flint consists of nearly pure Silica, a combination of Silicon and Oxygen in proportion of one to two. Silica exists in three distinct states, as amorphrus, graphitic, and crystalline. Silica is nearly isomorphic with carbon and its crystals are octahedral on the same system as the Diamond. Quartz, Chalcedony, Hornestone, and Flint, are all closely allied as varieties of Silica, and possess the same specific gravity, 2·6, are insoluble in boiling alkaline solution, and polarize light. Amorphous flint, however, having a special gravity not exceeding 2·3, does not polorize light, and is soluble in hot alkaline solutions. The solubility of Silica is of the highest interest to the Geologist. Silica dissolves to a certain extent in water containing alkaline carbonates, and in such solution fifteen times more amorphous than crystalline silica is taken up. It dissolves in pure water in one part to 769·230 according to Bischoff, and is largely present in the hot springs of Geyser and other volcanic waters. A yet more important form of Silica is the albuminoid colloid, or hydrated form which it takes on separation from solution under certain terms. One of these methods, in which the gelatinous silica was seen forming drop by drop, was most successfully demonstrated to the audience by Mr. Sidney Harvey. Its formation by dialysis, in which the various reagents acted gradually through a porous membrane, had a distinct relation to the present consideration, where analogous circumstances were to be found in alternations of porous and non-porous beds, through which mineral solutions might percolate or be arrested, separating and depositing their constituents. This liquid form of silica possesses some remarkable properties. It may contain as much as 14 per cent. of silica,

be perfectly limpid and not viscous. It gelatinizes under the action of heat, unless much diluted it is not easily preserved; it becomes opalescent, and the jelly separates, which cannot be again dissolved in water. Coagulation is quickly effected by a solution containing a small quantity of any alkaline carbonate. This soluble form of silica unites with various organic matters. There is reason to believe that this solution may play an important part in the phenomena of nature; there is no difficulty in explaining how such a solution can be obtained. Bischoff, in his "Chemical Geology," states, "It is very deserving of notice that carbonate of lime may be displaced by almost all silicious substances, and consequently it is possible that entire layers of limestone may be displaced by silica, and this may serve to account for some remarkable instances of the occurence of quartz layers in the sea." "It may be inferred that when water exercises a decomposing and solvent action on minerals, silicates with excess of acid, and others with excess of lime are formed, the more soluble product being removed and the less soluble left. Hence it is intelligible that the alteration of the composition of minerals exposed to such influences should be very gradual, and in the first stage scarcely recognizable by either mineralogical or chemical means." It has been shown that water containing carbonic acid, with alkaline carbonates and silicates may deposit silicious substances with very minute admixture of bases. Such is the case with flint and opal, which contain small quantities of alumina, lime, soda, and oxide of iron.

Bearing in mind then this capability of carbonate of lime, by certain means, being displaced by silica or flint, a true explanation of the nature and peculiarities of flints may be arrived at. It is by no means intended to invalidate the observations of Bowerbank and Johnson, who have found organic substances converted into flint. But too much reliance should not be placed on these supposed organic structures, for a section of chalk itself after certain preparation will exhibit under the microscope structure almost identical with that possessed by flint; a large number of sponge spicules are always present in chalk, and these will also become apparent. Because the most delicate structures of organisms have been preserved in these flints, it has been assumed that the silicification was instantaneous, or at any rate immediately after the death of the animal, but animal bodies may have been entombed in the soft mud at the bottom of the ocean, have been preserved for a lengthened period until so far mineralized by the surrounding elements that a further metamorphism may have completed their preservation. Casts too in the soft mud of the chalk-sea may have preserved so true a likeness of the individual that when silicified they would give the

true form of the enveloped fossil. In geological formations there is an alternation of porous and non-porous beds, organic remains are more abundant in the latter, owing to the animal structure having been dissolved out of the percolating water in the former. Many sandy beds are thus destitute of fossils. Tabular flint is often found associated with a non-porous bed, the dissolved silica gravitating from above being arrested and consolidating.

The *tabular banded* flints found at the top of the chalk at the junction with the Thanet beds, are produced by the chalk having been stratified with alternate thin beds of porous chalk, and more argillaceous layers. The flinty structure is sometimes absent, a very granular chalk still remaining, then from the under surface of the flint above may be seen small stalactital points invading the chalky space thus undergoing silification. An opaque white band repesents the chalky layer, making these flints often resemble onyx-stone.

The *nodular banded* flints have a close alliance with the banded structure of agates, the opaque portions in both are most porous. In the process of silicification, the silica appears to be alternately more and less crystalline when deposited, or the bands may be formed by replacement of endogenous depositions within the geode. The banded structure in flint is generally associated with some cavity which is filled with chalcedony. A geode having in its centre beautiful crystals of amethyst was exhibited to demonstrate the banded structure formed from within.

The condition of the recemented flints alluded to in connection with the junction bed of the chalk and the Thanet Sand pointed to a more rapid formation of flint, the result of a greater proportion of silica in solution probably derived from the sandy beds above, and perhaps separated by a process of natural dialysis yielding gelatinous or "colloidal" form. The peculiar moulded form these flints take appears to confirm this.

So remarkably is flint associated with limestone, that when carbonate of lime is very abundant in Tertiary sandy beds, the fossil shells which constitute the limestone are converted into flint or or become silicified.

It may then finally be concluded that flint stones are a chemical product formed in the laboratory of Nature, that they often and indeed generally are associated with some organic substance, which in the first instance formed the nucleus round which the Silica gathered, but that organic substance need not be present.

The cordial thanks of those present were accorded to the President for his very interesting lecture and wishes were expressed that the subject might be taken up at some future time.

Mr. Sidney Harvey explained the apparatus and process used

for the formation of the Silica in a gelatinous state and exhibited a quantity of the "Flint Jelly" which had formed during the evening.

January 3rd.

Mr. Fullagar exhibited the fresh water sponge (Spongia fluviatilis), illustrated by diagrams, showing (since the last meeting December 6th) the production by growth of the pellucid, semi-transparent, gelatinoid substance termed sarcode, which had extended to some distance on the glass cell in which it was placed ; in the new sarcode the pores through which the current of water enters the sponge were observable, forming the incurrent, bearing with it the nutriment on which the sponge feeds. In the newly formed sarcode was to be seen a quantity of new spicules; they were pointed at each end. and their middle or centre was bulged out from which the growth extended to both terminal points; the mature spicules are a little bent or curved and pointed at both ends, but not bulged out in the middle. Some good specimens of the mature spicules had been cleaned and mounted by Mr. Hammond. They are composed of the pure silex as transparent as glass. The peculiar spicules of the ovaria were beautifully shown under Colonel Horsley's microscope. In a specimen that Mr. Fullagar had successfully mounted in damar, by first drying the ovaria and then in a drop of damar with a thin glass cover gently pressed down, the granular contents of the ovaria were pressed out, and the beautiful stellated form of the spicule was seen standing out in form of so many miniature palm trees ; the real form of them is stellated, at the two ends, connected together by a shaft, similar to two wheels on an axle. This form of spicule in the ovaria performs the double office of tension and defence.

In thanking Mr. Fullagar for his interesting observations and excellent drawings of the Fresh-water Sponge, Mr. Dowker observed that Mr. Fullagar had very aptly chosen the sponge for his observations, after having studied the Amœba and Actinophrys, as they possessed many properties in common. The sponge at one time had been considered a vegetable, but, though low in the scale of the animal world, it was endowed with many of the organs of the higher animals. The observations of Dr. Bowerbank and Mr. Grant had thrown a flood of light on these interesting animals. Mr. Fullagar has been happy also in getting the sponge to live and grow in confinement. The incurrent canals are doubtless clothed with vibratile cilia; for though these are very difficult of detection, owing to their extreme minuteness and transparency, they have been

supposed to have been detected by observers, and from analogy, we might expect such to be the case. The infusoria always possessed them, and they were even supposed to be present in the diatom and desmid. The sponge was invested with a sarcode, resembling that composing the entire bed of the Ameba, and this sarcode had the property of fulfilling all the functions of digestion, assimilation, reproduction, and perhaps of sensation. The entire sponge may be likened to one great stomach, the sarcode in many particulars resembling the numerous membranes of the higher animals. The particles of organic matter brought in contact with it by the currents, induced in the incurrent canals of the sponge, were assimilated and partially digested before passing out at the cloacal cavities. The growth of the sarcode had been noticed by Mr. Fullagar, and the Amœba-like projection described. It had, moreover, been discovered by him that the spicules were produced from the sarcode, and were at first bulged in the centre. These spicules were composed of fine silica, though invested by the animal matter. The sponge then only derived nutriment by means of the sarcode, but separated the silica from the water, and built up with it its characteristic spicules; these differed in the ovaria, which had also been carefully noticed by Mr. Fullagar. The sarcode in the sponge builds up its own peculiar skeleton in like manner to which the Foraminifera build up their wonderful shells. It is wonderful to observe how nature uses the same means, and these apparently similar and simple, and produces man, the highest of the animals, and the sponge the lowest. As we approach the higher animals so do we find a greater complexity and separation of various functions. Thus the brain in man, from whence proceeds the nervous powers, is in the lower spread over the entire animal, or, more correctly, collected in reservoirs in its different parts. And the sarcode of the sponge contains the vital functions of many separate organs in the higher animals.

March 1*st*, 1877.

Raphides as botanical characters.—Mr. Hammond, of Milton Chapel, exhibited a series of slides prepared from the Butcher's Broom (Ruscus aculeatus), and well adapted for microscopic examination. Before the researches of the Hon. Secretary (Mr. Gulliver, F.R.S.), all microscopic saline crystals in plants were called Raphides, so as to confuse very different objects and to destroy their value as characters in systematic botany; and this error is continued in the last edition of the "Micrographic Dictionary" and other works in which we might expect more regard to correctness. Even in our systematic works of botany, to which the facts would be of great value, no use whatever is made of the

characters presented by raphides. For example, in the British flora, the sharpest and shortest diagnosis of the order Onagraceæ would be Calycifloral Exogens abounding in raphides; and so in like manner of the order Galiaceæ and Balsaminaceæ. But as already intimated, these valuable characters are always ignored, and would not avail if we still persist in the error of confounding very different crystals under one name. To conform to the truth in nature, microscopic plant-crystals may be distinguished thus: I. Raphides, occurring loosely in bundles, commonly within a cell, each crystal with a rounded shaft vanishing both ends to points and so like a needle as to derive their name from the Greek word for that useful implement. 2. Long Crystal Prisms, which are also needle-like forms, but with faces and angles to the shafts and tips, and occurring either singly, or two or three so consolidated together that they never admit of motion on each other. 3. Short Prismatic Crystals, cuboid, lozenge-shaped, square, and other forms more or less prismatic, immovable, and contained in cells firmly impacted in the tissues, mostly in chains along the vascular bundles of the plant. 4. Sphæraphides, more or less globular or lenticular forms, commonly dispersed throughout the leaves and some other parts of plants. Sphæraphides are ofter granular, smoothish, or stellate on their surface. Any two or more of the foregoing varieties of crystals may occur together in the same plant.

Mr. Hammond's beautiful preparations were confined to the Butcher's Broom, in which the raphides are not so large and distinct as in some other orders. But excellent specimens of all the crystals may be found at any season. Raphides in any common Onagrad, such as the Fuschias and Willowherbs, in the Orchids, Star of Bethlehem, official Squill, &c.; Long Crystal Prisms, in the leaves of the Iris, and in the so-called Sweet Orris, in the wood or bark of Quillaja and Guaiacum; Short Prismatic Crystals in the leaves and other parts of many order of plants, well seen in most Legumens, such as the Dutch Clover, &c.; Sphæraphides in the Nettles, Pelletory of the Wall, Spindle Trees, Rhubarb, &c. One or other form of such crystals often affords an excellent test, as Mr. Harvey would prove, of the genuineness of a drug. In "Science Gossip," May 1st, 1873, engravings were given of all the crystals, except the short prismatic forms, which are shown in a plate of the "Monthly Microscopical Journal," December, 1873.

The Society were very thankful to Mr. Hammond for his instructive slides, and expressed a wish that he would make more contributions of the same kind, as they may illustrate a branch of phototony hitherto too much neglected It was mentioned that Mr. Hammond's skill might be profitably extended to slides of the raphides in the leaves of Hydrangia, the sphæraphides in the leaves of Euonymus and the Wall Pelletory, and the short prismatic

crystals in the leaflets of Trifolium; that such preparations might afford many agreeable and profitable half hours with the microscope, and that boiling the part of the plant in a solution of caustic potass exposes the crystals and their cells very plainly.

In connection with the paper read by Mr. Hammand, Colonel Horsley teased out from a leaf of the Butcher's Broom (Ruscus aculeatus) lying on the table the Raphides contained in the plant, and found them to be by measurement 1-533th of an inch in length.

Captain McDakin illustrated by two diagrams the structure of the sea cliffs at Folkestone, representing the lower chalk resting on the gault clay which being impervious to the water that passes through the upper chalk, and the fissures of the chalk marl, presents a yielding slippery surface over which the immense masses of the superincumbent cliffs slide seaward from time to time, producing landslips and fractures of the lofty escarpment, which have so lately led to the total suspension of traffic on the South-Eastern Railway between Folkestone and Dover. The water intercepted by the bed of clay is so charged with lime although perfectly bright and clear, that the shingle of the beach is concreted in some places into solid masses by the deposition of part of its lime, a curious reparation that nature here makes for the subterranean denudation that the springs are silently but constantly carrying on. The under cliff gradually forcing its way over the gault to the sea beach has been thrown into such a variety of fantastic forms that the miniature lake and mountain scenery it presents has suggested for this beautiful shore the name of "Little Swizerland."

Relative to subterranean denudation, a subsidence probably arising from this cause has recently presented itself in the neighbourhood of Wingham on a farm occupied by Mr. Laslett, where an opening has taken place near the brow of a gently sloping hill, having a diameter of fifteen yards from east to west, and twelve from north to south, and a depth of about forty-three feet. It is said that three arched cavities were visible near the bottom when first observed, but now are hidden by the accumulated surface water which has partly filled the hole, the tunnels may be the result of subterranean streams or springs which find their way out in the valley leading to Wingham, the soft loamy deposit here covering the chalk readily yielding to their action partly chemical and partly mechanical. I cannot find on enquiry that there was a chalk pit here of the kind locally known as a draw well, by which chalk is sometimes drawn to the surface for agricultural purposes. On the return of the dry season when the water shall have subsided, it will prove an interesting object to geologists, if not to the landed proprietor and tenant.

April 5th, 1877.

Structure of the red Blood-corpuscle of Fishes.—Mr. Hammond, of Milton Chapel, referring to his exhibition at the last scientific meeting, now presented drawings in illustration of the structure of the red corpuscles as shown while they were flowing within the minute blood-vessels of the yelk-bag of young trout, which had been hatched about a week from its eggs, in which the part was so transparent, and the fish so lively, that the circulation of the blood could be easily seen under an objective of half of an inch focal length. And when the red corpuscles were moving slowly, each of them were seen to contain a distinct nucleus, projecting on both sides of the corpuscle when it was seen on edge, and appearing equally plain when the corpuscle presented its broad surface to the eye of the observer. The facts were so plainly seen as to admit of no doubt of the existence of a nucleus in the living red blood-corpuscle of fishes, and thus far to settle a much disputed and obscure point; for it has been asserted on high authority that the nucleus is not found till after the escape of the corpuscle from the living animal, and is indeed purely a post-mortem phenomenon like the coagulation of the blood. This is the view of an eminent British physiologist, Professor Savory, F.R.S , whose memoir on the subject appeared in the "Proceedings of the Royal Society, March 18th, 1869, and has been generally accepted as conclusive in favour of the opinion that the nucleus does not exist in the living red blood-corpuscle. Only Professor Gulliver, F.R.S., was so far from being convinced that, he, in his "Observations on the sizes and shapes of the red corpuscles of the blood of Vertebrates," published in the "Proceedings of the Zoological Society," June 15th, 1875, states emphatically that he has "plainly seen in certain fishes the projections on the corpuscles, indicative of a nucleus, while they were flowing within the living blood-vessels" (p. 478). Thus, however truly Professor Savory's observations may have been made on frogs and newts, his conclusion that "the red corpuscle of all verbetrates is, in its natural state, structureless, and that, when living, no distinction of, paats can be recognized, so that the existence of a nucleus in the red corpuscles of Ovipara is due to changes after death or removal from the vessels" (pp. 340-350), is directly opposed by Mr. Hammond's observations. The question is important; for although the physiological import may be obscure, its taxonomic significance is so signal as to form the foundation of Mr. Gulliver's division of the vertebrate sub-kingdom into the two great sections of Pyrenaemata and Apyrenaemata, as explained and illustrated by a plate, in his paper above cited.

May 3rd, 1877.

Insect-trapping Plants.—Referring to Major Hall's interesting papers, and the historical introduction thereto, on Physianthus albens, a plant which catches and kills large insects, and belongs to the Asclepiad order, the Hon. Secretary now sent a note to the effect that several other Asclepiads had been long known to destroy insects in the same manner. An American botanist, Dr. Barton of Philadelphia, gave a paper in the thirty-ninth volume of the Philosophical Magazine, wherein he mentions, among other plants, two species of Asclepias which by the irritability of their stamens, capture and kill insects; and accordingly those very plants were called Muscicapæ Asclepiadeae, to which interesting group Major Hall's specimen must henceforth be consigned. Nothing is known of the use of this destructive action. It can hardly be for any advantage in the nutrition of the plant; but perhaps may be subservient to its fecundation, by conveying the pollen to the stigma. The question is one that might well engage the attention of persons who have Asclepiads in cultivation, and who are inclined to make a good use of their eyes. Of such observations Mr. Darwin has given an admirable example, in which he has shown, by micro-chemistry, that the leaves of such plants as Dionæa and Drosera entrap and kill insects, and by a process of true digestion convert this animal prey to the nutriment of the plant.

Nuclei in Blood-disk of Fishes.—The Hon. Sec. sent a few remarks on Mr. Hammond's interesting paper. Should the accuracy of his observations be confirmed and proved true of perfect and healthy fish, the validity of Professor Savory's observations on the red blood-corpuscles of frogs and newts would not necessarily be destroyed, though this excellent physiologist's conclusion that in *all* Ovipara the nucleus is due to the death or escape of the corpuscles from the body would be no longer tenable. It is conceivable that there may be an essential difference in this respect between fishes and batrachians; and, should this prove to be the case, it would be a new and curious diagnostic between these two classes of Vertebrates. And then the question would only be similar to that which was so much agitated upwards of a quarter of a century since, concerning the structure of these corpuscles throughout the vertebrate sub-kingdom. About that time one party of physiologists, following Hewson, declared that the nucleus is quite plain and distinct, while another party, with Dr. Young, Dr. Hodgskin, and Mr. Lister, maintained that there is no nucleus. But the subsequent researches of the Hon. Sec. had demonstrated that the disputants on both sides of the question were, as in the fable of the Chameleon, both right and wrong; for the regular blood-disks of Mammals have no nuclei, while the blood-disks of lower Vertebrates

are regularly nucleated; and hence Mr. Gulliver's two great sections of Vertebrates into Pyrenaemata and Apyremaemata. A wish was expressed that Mr. Hammond would continue his observations, extending them to mature fish, as well as to tadpoles and adult Batrachians.

The Blyborough Tick.—Concerning this parasite, which is described and figured in two plates and some woodcuts, in the February part of the "Proceedings of the Quekett Microscopical Club," and in "Science Gossip" for May, by Mr. C. F. George, M.R.C.S., Colonel Horsley communicated a note from Mr. Gulliver. Of the specimens sent by Mr. George to Mr. Fullagar, two had been examined at Oxford, and there pronounced to be identical with the Argas pipistrellæ, a species described by Professor Westwood in the "Proceedings of the Entomological Society of London," for the year 1872. And this determination agrees with the intimation in the last Report of the East Kent Society, that the Blyborough Tick might prove to be the parasite of the pipistrelle bat, and is certainly a close ally of the Argas which the Society has already shewn is peculiar in Britain, so far as is yet known, to Canterbury Cathedral, and of which creature a description had been given by Mr. Gulliver, junior, at former meetings, and engravings by Mr. Fullager in "Science Gossip." If the Oxford determination prove correct, the Blyborough Tick can no longer be regarded as peculiar or new, although Mr. George is the discoverer of it in the village church of Blyborough, near Kirton-in-Lindsay, Lincolnshire.

June 7th, 1877.

Mr. Reid, following the descriptions given by Owen and Rymer Jones, gave a lengthened demonstration of the Test and Jaw of the Echinus from diagrame and specimens preserved in the Canterbury Museum. He directed especial attention to the ossicles combined to form the apparatus, seizing, dividing, and titurating the food of the animal, commonly called the Jaws, and designated by naturalists, from the resemblance to a lantern, mentioned by Aristotle, "*Aristotle's Lantern.*" The structure was made up of forty small bones arranged in *fives* and *tens*; specimens of each of these were exhibited in the preparations exhibited. The rough rigid service of one side of the plates against which the food was said to be rubbed, appearing much like the line of a file was pointed out, and also the remakable form of a tooth edged and pointed, pointed like a chisel at one end and extended at the other in a long fibrous curved elastic strap. Mr. Reid thought there was more to be learnt yet about the mechanism by which this instrument was moved, and recommended the subject for further investigation by the members. He suggested that some relation might be found to exist between the lever-bones and these

strap-like appendages, though the authorities on the matter made no allusion to such a connection.

The Dragon-Fly.—Mr. Fullagar read the following paper on the Dragon Fly :—To witness the metamorphosis of the Dragon Fly has already been a source of delight to me whenever I was able to procure some of their pupas. During the last summer I was unable to get them, but this spring I have been able to get a considerable number, and have had nearly thirty fully developed out of my small aquarium. When the time has arrived for the change to take place (after being an inhabitant of the water for two years, and is about to become a denizen of the air) the creature climbs up the stalk of a water-plant or weed, and if no plant is found in the middle of the pond suited for the purpose it will come to the edge of the pond where rushes are growing, and climb up some distance from the water, taking care that nothing is in the way to obstruct the operation about to take place, or to injure the delicate and tender wings, which are quite soft when first drawn from their cases, for if an injury should be inflicted on them in that state, they would be rendered useless, and the creature would perish. When arrived at a place which is considered suitable for the metamorphosis to take place, the creature cautiously climbs up, and firmly clasps the reed with its legs, and gives two or three smart jerks of the body, that the hooks on its feet may perforate the stem, thus making a sure hold that will not give way during the operation. When firmly fixed the creature rests for a few minutes, remaining quite still and quiet, then a slight crack is seen slowly to open on the back of the thorax, which enlarges and soon the head of the Dragon Fly is seen to protrude; the two fore legs are next seen to be drawn out of the pupa case, when the middle and third pair of legs follow: thus the fly continues gradually to draw its body out of the pupa case, and to hang head downwards. In this position it rests for about 10 or 15 minutes, during which time the legs (which when first drawn out are quite soft) become hardened and strong. It is now ready for the next move, which is to turn itself upwards, and lay hold of the head of its now partly empty cases, to which the fly now clings with its clawed feet, and the remaining part of the body is drawn out, and hangs down in the same position that the head had previously occupied, then commences the unfolding of the wings, and the elongating of the body. The unfolding of the wings is truly beautiful. and really marvellous. How a fabric so delicate and intricate can grow to such perfection, folded up in a case so small, is indeed enough to excite our wonder and astonishment, and well calculated to fill us with delight when engaged in these observations, seeing that the wing cases measure only $\frac{3}{8}$ of an inch

in length, in which the wings are so wonderfully folded up. When the wings are fully expanded they measure nearly 1½ inch in length, and half an inch wide at their base, or broadest part. It having been suggested to me that the development of the wings from the folded condition was accomplished by air being forced in through the nervures of the wings, which are hollow tubes, I had recourse to an experiment with a view of proving this, but from what I was enabled to observe, I am of opinion that instead of air it is a liquid of a gummy nature, and of a greenish colour, that is forced by the efforts of the creatures through the hollow tubes of the wings; and when they are fully expanded this liquid dries, becomes transparent, and at the same time stiffens and strengthens the wings. While in the jupa state they are voracious feeders, and nothing comes amiss to them, tadpoles of frogs and toads, shrims, young newts, small fish, &c., and they are armed with a curiously contrived apparatus to catch their prey. This instrument is called a mask in consequence of its being placed over and covers the face and mouth of the creature, and on the approach of any animal it may be inclined to make a meal of, is thrown out quickly.

With the formidable clasper at the extremity, the creature is secured and conveyed to the mouth and thus held until consumed. The pupa of the dragon fly are generally seen crawling at the bottom of the pond or over the weeds, but they can swim with rapidity, in which action the legs take no part, they are laid close against the side. The motive power in swimming is obtained by a process of pumping, by which they are enabled to fill the hinder parts of the body with water, and when they wish to move with swiftness this water is, by a sort of piston, forced out with a sudden jerk, which has the effect of propelling the animal forward; thus its process is marked when swimming by a succession of rapid jerks. If it is lying near the surface of the water when suddenly alarmed it will throw a jet of water for some distance.

July 5th.

Captain McDakin exhibited some Fossil wood from Folkestone, and made some observations thereon, of which an abstract is given below. Mr. Dean introduced a variety of fresh water objects, among which were some very beautiful specimens of plumatella repens, which he had obtained from a pond in the neighbourhood, where a large quantity of them had been obtained during the last fortnight. Mr. Fullagar showed some specimens of the Melicerta ringens, together with another rotifer (Limnias ceratophylli), which he had lately discovered

in one of his aquariums. This rotifer lives in a transparent and narrow tube, through which the formation of the ova and the development therefrom of the young are plainly seen. This species displays only two ciliated lobes or wheels, whereas the Najas and Melicerta display four; nevertheless it is a pleasing object. The similarity of the Limnias, ceratophylli, Melicerta ringens, and the Tubicolaria Najas, was made plain by diagrams of the three, which were beautifully executed on a large scale by the author, so as to make the whole subject plain to the meeting, and to afford an excellent example by this kind of illustration.

Captain MacDakin then drew attention to some fossil wood from Eastwear Bay, near Folkestone. Although he had on a former occasion shown similar specimens, it was now the peculiar mineralisation of this wood that he begged to submit to the notice of the Society. It occurs in the junction bed between the lower greensand and gault clay, and is always more or less waterworn, being sometimes bored through by teredoes and other boring shells, it having probably been washed out to sea by some old river flowing from an unknown land, and having become waterlogged sank to the bottom of a sea that is now the upper bed of the lower greensand, where it is exposed to view as the cliff near Copt Point gives way from time to time before the battering action of the waves. It presents a flattened appearance in common with most fossil remains owing to the compression of the overlying rocks. Wonderful as is the train of thought which all this suggests, perhaps still more curious are the changes which have taken place in these specimens, which are now rather the form of wood than the thing itself, only about 6 per cent. of carbon remaining, instead of 50, the quantity contained in most woods, the rest, with the exception of 8 per cent. of moisture, being mineral matter, and that mineral consisting of 40 per cent. of phosphate of lime. Woods contain a minute quantity of phosphate of lime, but here we find an amount equal to that which we might expect in animal remains, bones of animals and fish containing over 50 per cent. of phosphates. The original carbonaceous matter, amounting to perhaps 50 per cent., having dwindled down to 6 per cent. The source of the phosphates is probably the highly fossiliferous overlying gault clay, containing numerous spherical bodies sometimes called turtles' eggs, the best explanation of these strange fossils being that they are not turtles' eggs at all, but the shrivelled-up bodies of the Belemnites, the extinct representatives of the cuttle fishes, who left their tails behind them in countless numbers, the egg-like part containing 40 per cent. of phosphate of lime. By that process (of which we find several instances, as the substitution of iron pryrites,

sulphate of lime, carbonate of lime and silica, for organic matter in fossils), the skeleton of the former wood has been left with a body strangely transformed into a mineral, that might be suspected in animal but least in vegetable remains.

August 2nd, 1877.

Structure of the Red Blood-corpuscles.—Mr. Hammond read a paper, illustrated by several drawings, on the interesting and vexed questien concerning the existence of a nucleus in the living red blood-corpuscle of viviparous vertebrates. In his paper, read at a late meeting of the Society and published, with engravings in the "Monthly Microscopical Journal" of last June, he answered the question in the affirmative as regards fish, demonstrating plainly the presence of the nucleus in the living red corpuscle as it flows in the minute veins of the yelk-bag of the young trout; and he now extends his observations, with the same result, to several mature fish of different species. Further, he submits to examination the corpuscles while they are alive, and flowing within the blood-vessels of frog-tadpoles and in a bird. The latter was the young duck, just hatched, in which Mr. Hammond found the edge of the foot-web sufficiently thin and transparent to allow of the circulation being well seen under a deep magnifying power. The result was still the same as in the fish, the nucleus being plainly seen in most of the red corpuscles while they were flowing in their containing veins or capillaries. In the frog, owing to the larger size and substance of the corpuscles, the nucleus was not so easily seen; but after careful adjustments of the focus the nucleus was demonstrable. Hence, in three classes of the oviparous vertebrates, he concludes that he has demonstrated the presence of a nucleus in the living red blood-corpuscle; and he supposes that one reason why Professor Savory and others could not see it, was because the corpuscles swell or become circular during stagnations; and contracting again and becoming transparent, when they escape from their vessels or to the object-plate, allow the nucleus to be seen, as all observers agree that it is then plainly visible. The point embraced by Mr. Hammond's researches is important, because, independently of the mere physiological question, it has a wide taxonomic significance, showing the validity of Professor Gulliver's two great divisions of vertebrates into Pyrenaemata and Apyrenaemata. Mr. Hammond's drawings well exhibited the softness of the corpuscles and how they either tail-out or otherwise alter in shape when passing a narrow channel; and in one of his sketches from the tadpole there was an admirable view of the nucleus in the fore-part of the corpuscle, and the envelope

extended into a tail behind; thus proving the compound structure of the living corpuscle, which many observers, by asserting that it is absolutely homogeneous, have hitherto denied.

Plumatella repens.—Mr. Fullagar read the following paper on this fresh-water polyzoon, which he illustrated by drawings and living specimens:—Among the most beautiful and interesting forms of invertebrate animals are those strange phytoidal productions which, long confounded with the polypes, were at last, by nearly simultaneous investigations of several naturalists. separated as a distinct group, and described by Thompson under the name of Polyzoa, and shortly after indicated by Ehrenberg under that of Bryozoa. They are chiefly inhabitants of the sea, where they may be witnessed under numerous plant-like guises; now spreading like a lichen over submerged stones or old shells, or the broad fronds of Laminaria and other sea-weeds; now forming soft, irregular, fungus-like masses, or hard, calcareous, branchy growths, like diminutive trees; and now again presenting the appearance of the most delicate and exquisitely formed sea-weed, or moss, offering, even to the unassisted eye, in the endless repetition of the same element of form, objects of surpassing symmetry and beauty. The Polyzoa, however, are not by any means exclusively confined to the ocean; and though by far the greater number are marine, yet in the still and running waters of the land, in the broad river and the rushing stream, in the pure, cold mountain lake and stagnant waters of the moory fen, species are to be found which in interest yield not one jot to their brethren of the sea, and offer to the naturalist an inexhaustible source of gratification, in the beauty of their forms and the wonders of their organization. The specimen shown under the microscope is one of the fresh-water polyzoas, the "Plumatella repens." They are very beautiful objects, and were obtained from a pond in the neighbourhood of Canterbury, where they were growing in great profusion. I have been enabled to keep some of them alive in a small cell for more than a month, and during that time have had ample opportunities of studying a little more of their economy by the aid of the microscope, of which, by the assistance of the diagram I have drawn, I will endeavour to explain. In order to keep them alive I had to feed them twice a day with monads, a large quantity of which I fortunately had in one of my aquariums, they were so numerous that the water appeared of a brown colour, and so thick and clouded by them that the gold fish contained in the glass was at times scarcely visible. The monads individually are perfectly invisible to the unassisted eye. On these monads the plumatella fed greedily, and as they were reduced by the action of the stomach in the process of digestion, the stomach became filled

with a rich ruby-coloured matter, thereby adding to the beauty of the Polyzoa by the contrast of colours, and beautifully displaying the action of digestion. By referring to the diagram, you will see that the mouth is surrounded by a number of tentacula, arising from a sort of stage or disc, termed the Lophophore. These tentacles are covered with vibratile cilia, which when in motion have the appearance of passing upon the one side of each tentacle, and down the opposite, the rapid motion of which causes a current of water to set in, in the direction of the mouth, bearing with it the food requisite for the support of the animal. The whole course of the alimentary matter thus obtained, from the moment of its prehension to its final ejection, may be easily witnessed in many of the fresh-water polyzoa. If a polypide of Plumatella repens be watched while in an exerted state, different kinds of Infusoria and other minute organic bodies may be observed to be whirled along in the vortices caused by the action of the tentacular cilia, and conveyed to the mouth, where many of them are at once seized and swallowed, and others rejected. The food having once entered the oesophagus experiences in this tube no delay, but is rapidly conveyed downwards by a kind of peristaltic action, and delivered to the stomach. In the stomach the food is destined to experience considerable delay; it is here rapidly moved up and down by a strong peristaltic action, which first takes place from above downwards, and then inverting itself, propels the contents in an opposite direction Every now and then the fundus of the stomach seems to perform some function distinct from the rest of the organ, in that it seizes a portion of the alimentary mass, and retains it for a moment by an hourglass restriction separate from the remainder, and then powerfully contracting on it, forces it back among the other contents of the stomach. All this time the food is becoming imbued with the peculiar secretion of the gastric walls, and soon assumes a rich brown colour. After having thus undergone for some time the action of the stomach, the alimentary matter is delivered by degrees into the intestine, where it accumulates in the wide pyloric extremity of this tube. After continuing here for a while in a state of rest, and probably yielding to the absorbent tissues its remaining nutritious elements, portions, in the form of oval shaped pellets, become separated at intervals from the mass, and are slowly propelled along the tube towards the vent, where having arrived, they are suddenly ejected into the surrounding water and rapidly whirled away by the tentacular currents. In all the fresh polyzoa, bodies of a very peculiar nature occur at seasons lying loose in the perigastric space; to these are given the name of statoblasts. From the earliest period that the freshwater polyzoa became an object of study, the statoblasts attrac-

ted the attention of observers; their form is not exactly the same in the different species, they vary accordingly, from an orbicular to an elongated oval figure, and enclosed in a horny shell, which consists of two concave discs, united by their margins, where they are further strengthened by a ring which runs round the the entire margin, and is a different structure from the disc. The ring is composed of cells, they are generally larger than the cells of the disc, and of a different colour; they are filled with air, giving the ring a light spongy texture, and act as a float, by which the statoblast when free is kept near the surface of the surrounding water. When the statoblasts are placed under favourable circumstances for their development, they open by separation from one another of the two discs or facies, and there then escapes from them a young polyzoon already in an advanced stage of development, and in all essential points resembling the adult individual in whose cell the statoblasts were produced. At the period of its escape it possesses all the essential organization of the adult, the retractor muscles are well developed, and the polypide is capable of regular exertion and retraction. The statoblasts have always been viewed and described as the eggs of the polyzoon in whose cell they occur. This has been a very natural mistake, and Professor Allam says he fell into that mistake himself, but he is now convinced that they are a peculiar form of bud, and must not on any account be confounded with genuine ova. They are produced in the funiculus from which they are evidently developed as buds, and may generally be seen in various stages of growth, arranged upon this chord, like beads on a necklace, being younger as they approach the distal extremities of the funiculus.

The statoblasts that had already been liberated through the death of some of the plumatella were shown under the microscope.

Mr. Jas. Reid produced some fresh preparations of the common Echinus or Sea-hedge-hog and various impressions of fossils from the iron-stone nodules in the Lenham sand-pipes, which he had recently collected. At the June meeting he had left a certain point for the consideration of the members relating to the probability of some attachment of muscles to the dental process in the Echinus jaw. From the construction of this process and certain marks on the lever bones, an inference had been drawn, that by muscular attachments this process might have an independent movement given to it by which it would have the force and action of a chisel. Within the last ten days, through the kindness of Mr. Hillier, of Ramsgate, he had an opportunity of solving the matter himself. He had determined, and afterwards demonstrated to some the members, that though distinct bands

of muscles passed from one lever-bone to the other at the points previously indicated on the dry bones, there were muscular connections with the curved elastic ends of the dental process; a mere cellular and vascular sheath for its nutrition connected with the general web between the two bones was all that existed. The power given to the dental processes was therefore derived from the co-ordination of the various muscles, some 40 or more in number, that were connected with the various bones surrounding the teeth.

In bringing before the notice of the members the various impressions of shells, &c., found in the Lenham sand-pipes, Mr. Reid briefly detailed the various iron-stone bands found in the strata of East Kent. He produced specimens from the junction bed of the London and Woolwich series, also of the Paddlesworth grit and compact iron-stone, showing in some specimens a tendency to a vesicular and cellular formation, instancing specially a large block in the Lobby of the Canterbury Museum, which demonstrated these changes on a large scale. He pointed out that a somewhat minute vesicular appearance was manifested in some of the Iron-sand-stones at Lenham, but this apparently had an organic rather than a mechanical cause, inasmuch as several zoophitic remains were found in the Lenham structures. A specimen of a Lepralia from this source was afterwards exhibited under the microscope. The several opinions as to the sources of these fossils were briefly mentioned. Mr. Reid showed that some of the impressions were derived from the remains in chalk, particularly from fragments of the large Inoceramus, in some of which small portions of shelly matter still remained, flints with ventriculites and rolled pebbles resembling those of the pebble-bed at the top of the Woolwich series, some of them whitened by contact with chalk, were found incorporated in the iron-stone blocks. It would seem that the fossils were derived from several beds, rather than one. The matter was worthy of closer and more extended observation by the members of the Society. The facilities for doing this were pointed out.

Colonel Horsley exhibited a fossil shell from Mount Lebanon, also a piece of slag from ancient Tyre having the appearance of melted glass, supposed to be taken from the centre of the furnace used for the manufacture of that article.

September 6th, 1877.

Colonel Horsley exhibited a number of living specimens of marine zoology, collected at Whitstable by himself, in company with Mr. Fullagar and Mr. Saunders, and called on Mr. Saunders to give a short description of them.

Among the objects which first attracted the eye were some beautiful examples of the family of *Botryllians*; animals belonging to the class Tunicate Molluscs; but instead of being, like the larger Ascidians, solitary, the Botrylli form a composite mass adhering to sea-weed, which is often seen covered with gelatinous matter, on which is traced a pattern in lighter colour, like some exquisite enamel. Each of the star like devices is a group of these minute ascidians, and there may be any number of groups on a single piece of fucus or laminaria. The colours of the different species vary considerably, and the three genera exhibited, viz., *Botryllus*, *Distoma*, *Botrylloides*, comprised specimens whose colours were green, violet, and orange in different shades.

The specimens of the larger Ascidians were interesting, as showing the character of the leathery "tunic," and the primary and secondary orifices (present in all members of the class), but the circulation of the blood, and the action of the cilia, which cover the interior of the respiratory sac, can only be well observed in the transparent species, and Mr. Saunders reminded the meeting that a fine specimen of *Clavelina*, in which these phenomena were well observed was exhibited at the last meeting held at Whitstable.

The structure of these tunicate animals is in many respects similar to that of the *Polyzoa*, of which a number of specimens were to be found among the marine objects now exhibited. But the Ascidians lack the beautiful crown of ciliated tentacles which is a distinguishing feature in the polyzoa, and which makes these minute creatures such attractive objects to the microscopist. Among the species brought this evening, Mr. Saunders showed under the microscope *Bicellaria ciliata*, bearing the remarkable *avicularia*, or "Bird's-head" appendages. These were seen moving up and down, and snapping the beak with great vigour. The use of these curious organs is unknown, but it is now generally supposed that they are serviceable in catching and holding minute worms, or other animals, and that the infusoria produced or attracted by the decomposing animal serve as food for the polyzoan. Some of the marine hydroid zoophytes were also shewn, including *Sertularia pumila*, *Campanularia volubilis*, &c.

Mr. Dowker exhibited a very rare umbelliferous plant and one quite new to him in East Kent. As far as he could ascertain (the plant not being in fruit), it was a Daucus, of which there are but two recorded in Britain, viz., Daucus Carota, the common wild Carrot, and Daucus Maritimus—but Babington describes a plant as distinct from either of these as D. gingidium, to which description this plant appears best to answer. It is characterised by the general involucre being

linear pinnatifid with broadly membranous winged stalks, resembling that of Daucus Carota. The leaves are rather fleshy, digitate, clasping the stem which is furrowed and smooth (not hispid) umbel convex; plant, about three or four feet in height. Mr. Dowker had sent a specimen of the plant for identification to Mr. F. Hambury, who is about to publish a flora of the county, but has not received his reply.

Mr. Fullagar brought for inspection a beautiful fresh water polyzoa which he had received from Croydon, found in that neighbourhood, the species of which the sender was not able to make out with certainty.—At first sight it was thought to be Alcyonella fungosa, but on further examination, and by referring to Professor Allman's monograph of the fresh water polyzoa, it proved to be Plumatella coralloides, it was very transparent, and that singular motion of various shaped bodies rotating within the perigastric space, was plainly seen; also the formation of statoblasts in various stages of growth, and some buds in formation, which is one way by which the animals are multiplied as well as by statoblasts.

October 4th, 1877.

Prolification of Scabious.—Mr. Sidney Harvey made some remarks upon the phenomenon of prolification as exhibited in two plants of Scabiosa Succisa, or Devil's bit, found by him in the neighbourhood of Canterbury. These plants, which were growing close together, and were nearly four feet in height, resembled Umbellifers as regards their inflorescence, the florets in many instances having developed into stalks 1½ to 2 inches in length, and bearing an ordinary capitulum in full flower at the summit of each. Hardly a flower-head in either plant had escaped this development to any extent, and the appearance was very remarkable.

Mr. Fullagar on Sponge Fluviatilis.—Some young living fresh-water sponge, in various stages of growth, was exhibited by Mr. Fullagar, and illustrated by drawings; specimens of the common spicular mounted for the microscope, and also the curiously-formed sheltered spicula of the ovaria, which he had very successfully mounted in dammar, on which he made the remarks reported below:—

British Fresh-water Sponge.—In December last year, and January of this year, I exhibited some living fresh-water sponge from the river at Littlebourne, a small piece of which I had placed in a cell for observation, and the growth of new sponge was observed spreading on the glass, there were also a number of the ovaries in it; ultimately the sponge died and the ovaries

were left living in the decayed sponge. I kept the ovaries, intending when I had time to mount some of them for the microscope. In August last my attention was called to the glass cell containing the ovaries, when I observed around some of them, what looked very like the new sponge that I had seen in January last, and on placing it under the microscope it proved to be young sponge, which, without doubt, had proceeded from out of the ovaries through the foramen, which was now seen to be open, and the interior quite empty. The escape of the contents of the ovaria I should have liked to have witnessed, as this would be very interesting indeed; but this had already taken place, and the new sponge was growing round the empty ovaries. The first I saw appeared as a thin gelatinous, semi transparent matter adhering to the glass, in which at first no spicula were visible, nor were the pores discernable. This was on September 1st; by September 7th the sponge had grown, and spicules were numerous, projecting over the edge of the first-formed sponge, and the inflated tube, or ex-current canal during that time had been produced, through which a swift current of water was seen to pour, carrying out with it the effete particles from the interior of the sponge; the incurrent was also visible through the pores. When small particles of floating matter slowly approached the edge of the sponge and had got within the influence of the incurrent, its motion was then visibly increased, and it then darted quickly into the open pores of the sponge. This current drawn in through the pores, and discharged through the ex-current canal is caused by cilia with which the sponge cells are lined. This cilia I believe has never been seen in operation *in situ*, it is impossible to see it *in situ*, as it requires a high power of the microscope to detect it, and that cannot be applied to the pores of the living sponge, as the mass of the sponge is too thick. With a view of detecting if possible the cilia in the living sponge, Mr. G. Gulliver, jun., brought his microscope, with a high power objective, and took out one of the small growing sponges from the glass cell in which I kept them, but the cilia could not be seen until he tore the sponge to pieces with needles, thereby breaking open the sponge cells, when the cilia was plainly shown, lashing, whiplike, and becoming slower in its motion as the death of the sponge approached, when the cilia became rigid and motionless. These openings which are denominated pores, are lined with sponge particles, each of which is provided with a vibratile cilium; and as these cilia work in one direction towards the ex-current canal, they sweep the water out in that direction, and its place is taken by fresh water, which flows in through the small apertures. The currents of water carry along such matters as are suspended in them, and these are appropriated by the sponge particles lining the passages. By the next meeting it may be possible to give some further illustration of this interesting subject.

November 1st, 1877.

Mr. Hayward showed a variety of objects under the microscope, which he had mounted, among them was the Virginian creeper, which, by a process he had rendered transparent, so that the cells of the plant, containing bundles of raphides *in situ* were beautifully displayed.

Mr. Wetherelt exhibited a slide containing embyro oysters, on the economy of which he had made some interesting remarks; he also exhibited some sections of coal.

Mr. W. Horsley, of Watling-street, submitted to the inspection of the members a specimen of the locusts, which he had received through his son from the Persian Gulf.

Mrs. Terry, of Burgate-street, exhibited a beautiful collection of minerals from Greensides, Cumberland, and some of the characteristic fossils of the lower Greensands.

Mr. Fullagar produced from his aquarium some hydra fusca, making a few remarks on their manner of development from ova, and some living fresh water sponge, which he had had under observation for over two months.

December 5th, 1877.

Captain McDakin showed some fossils from the Bognor beds, belonging to the Lower Tertiaries of the Hampshire basin. One of the shells, a Pectunculis brevirostris, exhibited on being broken open four young oysters, who, long ages ago, after a short period of youthful activity, settled down for life on the gaping shells of this dead bivalve, and from some unknown reason met with a premature death, at a period geologically late but so long ago that geologists, who are accustomed to contemplate as vast periods of time as astronomers are the great distance of the stars, may well fail to understand how great is time, and how important an element it is in the condition of things we see around us. Though but few formations occur above the London clay in this country, those few represent a vast period of time. Geographically the Tertiaries occupy two basins, one to the north, known as the London basin, and the other to the south as the Hampshire basin, the former may be roughly traced from the coast near Ipswich, to Hertford, Reading, and beyond Newbury, then turning to the south and following a line running eastward passing through Guildford, Croydon, Chatham, Sittingbourne, Faversham, to the Reculvers, and re-appearing from under the alluvium between the Isle of Thanet, and main-land, at Pegwell Bay, extending as near Canterbury as the Harbledown hills; the cliffs at Whitstable and Herne Bay affording fine sections of the London clay. The Hampshire Tertiaries fill a trough con-

tained between the South Downs, and the chalk of Isle of Wight, extending westward beyond Dorchester, and eastward as far as Worthing, Bognor giving the name to some calcareous sandstones of which the fossils exhibited are characteristic. These bivalve shells are most persistent forms of life; we may trace them up from the Lower Silurian rocks through the first life of the Paleozoic division of the earth's history, the Mesozoic reptilian age, and find them the contemporaries of the mammals of the Cainozoic or Tertiary, until we, in the human period, see them represented by the mussels, and oysters "after his kind," in the shops of the fishmongers or on the barrows of the costermongers, and so may look upon the mollusc represented by the oyster as the true native of the world, and regard him with increased respect, and have cause to swallow him with a greater relish. These fossil creatures, but low in the scale of creation, lived and died and exhibited the uncertainty of life by dying before they arrived at maturity, thus forming not only an interesting geological specimen, but a moral record of the uncertainty of life.

EAST KENT NATURAL HISTORY SOCIETY.

MEETINGS 1878-79.

SCIENTIFIC on WEDNESDAYS, at 7 o'clock.

March	6, 1878
April	3, ,,
May	1, ,,
June	5, ,,
July	3, ,,
August	7, ,,
September	4, ,,
October	2, ,,
November	6, ,,
December	4, ,,
January	1, 1879
February	5, ,,
March	5, ,,
April	2, ,,

N.B.—The Committee meet on the Saturday next following the date of the Scientific Meeting in each month.

ANNUAL MEETING,

TUESDAY, JANUARY 28, 1879, at 4 o'clock p.m.

TWENTY-FIRST REPORT

(1878)

OF THE

EAST KENT

NATURAL HISTORY SOCIETY,

ADOPTED AT THE

Annual Meeting,

Held at Canterbury, on January 28th, 1879.

CANTERBURY:

PRINTED AT THE "KENTISH GAZETTE" OFFICE, HIGH STREET.

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CONTENTS.

EAST KENT NATURAL HISTORY SOCIETY.

REPORT OF THE COMMITTEE FOR 1878.

Consequent upon the protracted illness and confinement to the house of the President, Hon. Secretary, and Hon. Assistant Secretary, the scientific work of the past year was confined to the ordinary monthly meetings of the members, at which papers on various interesting subjects were read and objects exhibited under the microscopes. As the more important of these papers will be printed *in extenso* with this Report, it is unnecessary to notice further than enumerate them, and the pages in which they are to be found in the Report, as follows:—

1—Paper by Mr. W. H. Hammond, "On Spheraphides;" also, a register of the Rainfall at Milton Chapel for 1877, and the greatest Heat registered in the shade, for the same year (pp. 20.)

2—Paper by Professor Gulliver, "On the Minute Anatomy of Plants," illustrated by drawings of Raphides and other microscopic plant crystals (pp. 21).

3—Paper by Mr. W. H. Hammond, "On the method of preparing vegetable tissues, with the view of examining the crystals in different plants more perfectly under the microscope" (pp. 24).

4—Remarks "On a specimen of the large saw-fly (Tenthredo)," by Mr. Fullagar (pp. 27).

5—Observations by Captain McDakin "On some foliated crystals of Heavy Spar or Sulphate of Barytes, from the interior of a septaria found in the London clay of the Isle of Sheppy" (pp. 28).

Also, in continuation of the same subject, remarks by the same member "On a Septaria from the Weald clay of the Isle of Wight" (pp. 29).

6—Paper "On Lythrum Salicaria, or Purple Loose Strife, explanatory of the three forms of the same flower found growing on the side of a dike in the neighbourhood of Canterbury, with extracts from Darwin's book, entitled 'Forms of Flowers,'" by Colonel Horsley, R.E. (pp. 29).

7—A paper "On Utricularia Minor, and its carnivorous habits, with specimens of the same as grown in his Aquarium," by Col. Horsley, R.E. (pp. 31).

8—Remarks by Captain McDakin "On Chalk, its origin and properties" (pp. 33).

9—An address by the same officer "On Gravel Beds,' drawing the attention of the members particularly to the accumulation of flints originally derived from the chalk, and now constituting the tertiary pebbles and subangular gravels (pp. 35).

10—Remarks by Col. Cox "On the Eggs of a Lung-breathing Snail, the Bulimus haemastoma" (pp. 37).

11—"Some phenomena connected with the freezing of water," witnessed by the author in the old fort walls enclosing the Dane John, at Canterbury, by Captain McDakin (pp. 38).

12—Mr. Sibert Saunders' "Description of a Sun Star (solaster papposa)," found at Whitstable (pp. 40).

13—"Remarks on a species of Rotifer Limnea Annulata," found at Eastbourne, by Mr. Jas. Fullagar (pp. 40).

There are at the present time 86 members, five of whom have joined the Society during 1878.

The total expenditure during 1878 amounted to £30 0s. 4d., inclusive of £5 15s. 0d. paid to the Librarian.

The receipts from subscriptions for the year 1878 were £27 16s., to which must be added £5 5s., arrears of previous years collected in 1878, making a total of £33 1s., or including the balance remaining in January, 1878, of £35 14s. 11d. There are still arrears amounting to £17 5s. unpaid, some going back as far as 1874. It would be well if those Members who are in arrears would either pay up their subscriptions or signify their wish to retire from the Society.

The funds being at a low ebb the Librarian refrained from calling upon the Treasurer for the whole of the £12 voted for the use of the Library in 1878.

On the whole, the Society is fulfilling its functions under many disadvantages, among which are the expenses of rent and of rather frequent and compulsory removals. But it keeps alive a spirit of inquiry in various branches of natural history; and maintains and increases its library, which is of paramount importance, and indeed is probably more complete than any other collection of similar books in such a society in this county.

Your Committee cannot close this report without returning especial thanks to our excellent President, Hon. Treasurer, and Hon. Librarian. Indeed, though he has been confined by illness, he has still continued to perform the duties of these three

important offices, which, but for his valuable services, would have been in abeyance. The thanks of the Society are also due to all its other officers, to the members of the committee, to the authors of the papers already mentioned, and to the donors of the books or pamphlets which are specified in the Librarian's report. Your Committee venture to express the hope that Colonel Horsley will continue to accept the office of President of the Society.

LIBRARIAN'S REPORT FOR 1878.

The funds of the Society not admitting of the usual grant to the Library, the expenditure in connection therewith has been confined to the purchase of the periodicals and two new books, viz. :—

Darwin's Different Forms of Flowers, 1 vol., 8vo., 1876.
Epoch of the Mammoth, by James C. Southall, A.M., LL.D., 1 vol., 8vo., 1878.

The expenditure, amounting in all to £5 18s. 6d., was made up of the following sums, viz., for periodicals, £4 1s. 6d.; for new books, 17s. 9d.; for binding 9 vols. of previous year's periodicals, 19s. 3d.

The volume from the Ray Society, due for 1876, was received in 1878, viz., "G. S. Brady on the British Copepoda," vol. 1. Those for 1877 and 1878 are still due.

The following pamphlets, &c., were presented to the Society during 1878, viz :—

Seventh Report and Abstract of Proceedings of the Croydon Microscopical Club.
Papers of the Eastbourne Natural History Society.
Several Numbers of Nature, presented by Mr. Rigden, M.R.C.S.
Paper by Mr. W. H. Hammond on the Structure of the Red Blood Corpuscle, presented by the author.

FINANCIAL STATEMENT, 1878.

RECEIPTS.

	£	s.	d.
Balance, January, 1878	2	13	11
Subscriptions for 1878, received up to to 17th January, 1879	27	16	0
Arrears for previous years paid in 1878, and up to 17th January, 1879	5	5	0
	£35	14	11

EXPENDITURE.

	£	s.	d.
Rent of Room, No. 6, High Street, for one year	15	0	0
Fire Insurance on Library and Instrument	0	6	9
Subscription to Ray Society	1	1	0
Contribution to Library	5	15	0
Hon. Assistant Secretary, Petty Cash and Sundries	1	13	6
Ward, for Printing Reports, &c.	6	3	6
Post Office Order and Postage	0	0	7
Balance 22nd January, 1879	5	14	7
	£35	14	11

W. H. HORSLEY, Colonel,
Hon. Treasurer.

Examined and found correct, January 22nd, 1879.
GEORGE RIGDEN.

Canterbury,
January, 1879.

LIST OF BOOKS AND PERIODICALS.

BELONGING TO THE EAST KENT NATURAL HISTORY SOCIETY.

VERTEBRATA.

Bell's British Quadrupeds, 1 vol., 8vo.
Cassell's Book of Birds, 1 vol., 4to.
Couch's Fishes, 4 vols., 8vo., 1862-66
Flower's, H. W., Recent Memoirs on the Cetacea, 1 vol., folio, 1866. Ray Society.
Munro's Structure of Fishes, 1 vol., folio, 1785
Nitsch's Pterylography, 1 vol., 4to., 1867. Ray Society
Parker's Structure, &c., of the Shoulder Girdle and Stronum in the Vertebrata, 1 vol., 4to., 1868. Ray Society.
Swainson's Birds, 2 vols., 12mo.

PAMPHLETS.

Gulliver, G., F.R.S., on the Red Corpuscles of the Blood of Moschus, Tragulus, and Orycteropus
Ditto, Memoirs on the Blood of Lamna Cornubica
Ditto, On Blood Corpuscles of the Hippopotamus, Eared Seal and Walrus.
Ditto, On the Muscular Sheath of the Œsophagus of the "Aye, Aye," (Chiromys Madagascariensis)
Ditto, On the Fibres of the Crystalline Lens of the Petro myzonini.
Ditto, On the Æsophagus of the Red Hornbill.
Ditto, On the Œsophagus of Sauropsida and other Vertebrata
Ditto, On the Size of the Red Corpuscles of the Blood of the Salamander, &c.
Ditto, On the Measurement of the Red Corpuscles of the Blood of Batrachians
Ditto, Sketches of the Spermatozoa of Petromyzon.
Hammond, W. H., On the Structure of the Red Blood Corpuscles, &c.

INVERTEBRATA.

Allman's, G. S., M.D., Freshwater Polyzoa, 1 vol., 4to., 1856, bound with Burmeister's Trilobites
Ditto, Monograph Gymnoblastic, or Tubularian Hydroids, parts, 1 & 2, folio, 1871-72, Ray Society
Baird's Entomostraca, 1 vol., 8vo., 1850, Ray Society
Baker's Natural History of the Polype, 1 vol., 8vo., 1743
Bevan on the Honey Bee, edited by Major Munn, 1 vol., 8vo., 1870
Bowerbank's, Dr., Monograph of British Spongiadæ, 3 vols., rl. 8vo., 1861-66-74, Ray Society
Brady's, G. S., Monograph of the Copepoda of British Isles, 1 vol., 1878, Ray Society
Buckton's, G. B., Monograph of the British Aphides, vol. 1, 8vo., 1876, Ray Society.
Carpenter's Foramenifera, Ray Society, 1 vol., folio, 1862
Curtis on Farm Insects, crown 8vo., 1 vol., 1860
Darwin's Cirripedia, Ray Society, 2 vols., 8vo., 1851-54
Denny's Monographia Anoplurorum Britanniæ, 1 vol., 8vo., 1842
Douglas and Scott's British Hemiptera, Heteroptera, 1 vol., 8vo., 1865, Ray Society
Forbe's, Professor E., British Naked Eyed Medusa, 1 vol., 4to., 1848, Ray Society
Ditto British Star Fishes, 1 vol., 8vo., 1841
Gosse's British Sea Anemones, &c., 1 vol., rl. 8vo., 1860
Greene's The Insect Hunter's Companion, 12 mo., 1863
Hanley's Larmarck's Shells, 1 vol., 8vo.

Huxley's Oceanic Hydrozoa, 1859, 1 vol., crown folio, Ray Society
Johnstone's British Zoophytes, 2 vols., 8vo., 1847
Kirby's British Bees, 2 vols., 8vo., 1802
Kirby and Spence's Introduction to Entomology, 4 vols., 8vo., 1828-29
Lubbock's, Sir John, Collembola and Thysanura, 1 vol., 8vo., 1873. Ray Society
Martyn's, T., English Entomologist, 1 vol., 4to., 1792
McIntosh's, W. C., M.D., British Annelids, part 1, 1873, crown folio, Ray Society
Ditto ditto, part 1 continued, 1874. Ray Society
Morris's British Butterflies, 1 vol., crown 8vo., 1864
Newman's Butterflies and Moths, 1 vol., crown 8vo., 1874
Pritchard's History of Infusoria, 1 vol., rl. 8vo., 1861
Reeve's British Land and Fresh Water Molluscs, 1 vol., 8vo., 1863
Smith's Diatomaceæ, 2 vols., rl. 8vo., 1853
Staveley's British Insects, 1871, demy 8vo.
Turton's, Dr. W., Land and Fresh Water Shells, 1 vol., 8vo.
Westwood's Butterflies of Great Britian, crown 1 vol., 4to., 1855
Ditto Modern Classification of Insects, 2 vols., 8vo., 1839-40
Westwood and Humphrey's British Butterflies, &c., 1 vol., 4to., 1841
Williamson's Recent Foraminifera, 1 vol., 4to., 1858. Ray Society
Wood's Common Shells of the Sea Shore, 1 vol., 12mo., 1865

PAMPHLETS.

Bates' Phasmidæ
Broeck, A., Crustacea Amphipoda Borealia et Arctica
Fullagar, J., On the Development of Hydra
Gulliver's, G., F.R.S., Sketches to Scale of the Auditory Organs of Molluscs
Hammond's, A., Comparison of the Metamorphosis of the Cranefly and the Blowfly
Lubbock's, Sir J., Chlœone
Munn's, Major, Bee Keeper's Magazine, one part
Ditto The Apiary
Sars, Michael, Memoirs des Criniocles Vivants
British Moths, Nocturni
" Geometræ

BOTANY.

Bentham's Hand Book of the British Flora, 2 vols., 8vo., 1865
Berkeley's Cryptogamic Botany, 1 vol., rl. 8vo., 1857
Ditto British Mosses, 1 vol., rl. 8vo., 1863
Ditto Fungology, 1 vol., rl. 8vo., 1860
Brewer's, J. A., Flora of Surrey, 1 vol., 8vo., 1863
Brown's, R., Miscellaneous Botanical Works, 2 vols., 8vo., Ray Society, 1866, and 1 vol. Atlas of Plates, 1868
Clarke's Common Sea Weeds, 1 vol., 12mo.
Cowell's, M. H., Floral Guide to East Kent, 1 vol., 8vo., 1839 (2 copies)
Darwin's, Chas., F.R.S., Forms of Flowers, 1 vol., 8vo., 1877
Ditto Insectiverous Plants, 1 vol., 8vo., 1875
Dillwyn's British Confervæ, 1 vol., 4to., 1809
Evelyn's Silva, 2 vols., 4to., 1786
Gatty's, Mrs., Atlas of British Sea Weeds, from Professor Harvey's Phycologia Britannica, 1 vol., 4to., 1863
Harvey's, Professor, Synopsis of British Sea Weeds, 1 vol., 12mo., 1857
Henfrey's Elementary Botany, 2nd edition, by Dr. Masters, 1 vol., 8vo., 1870
Hooker's Jungermanniæ, 1 vol., 4to., 1816
Jacob's, Faversham Plants, 1 vol., royal 12mo., 1777
Leighton's British Lichen Flora, 1 vol., 8vo., 1872
Lindley and Moore's Treasury of Botany, 2 vols., 8vo.
Loudon's Encyclopædia of Plants, with 2 supplements, 2 vols., rl. 8vo., 1841-55
Masters' Vegetable Teratology, 8vo., Ray Society
Pulteney's Progress of Botany in England, 2 vols., 8vo., 1790
Ralf's Desmidiæ, 1 vol., crown 4vo., 1848

Smith's, G. E., East Kent Flora, 1 vol., 8vo., 1829
Ditto, Sir J. E., English Flora, 4 vols., 8vo,
Wilson's Bryologia Britannica, 1 vol.

PAMPHLETS.

Blytt, A., Phanerogamer of Bregner
Gulliver, G., F.R.S., Crystals in the Testa of the Elm and the Character of the Epidermis of the Tway-Blade
Ditto, Notes on Lemnaceæ and the Raphidian Character of Plants
Ditto, Sphæraphides in Urticaceæ and Leonurus
Hall and Woodhouse, Misses, Orchidaceæ found near Eastbourne
Miller, C. T., On a New Fungus
Woodhouse, Miss, Adoxa Moschatellina

PERIODICALS.

The Phytologist, vol. 3, 1859.

GEOLOGY.

Burmeister's Trilobites, 1 vol., 4to., 1846, bound with Allman's Freshwater Polyzoa, 1856
Conybeare and Phillips' Geology, 10th edition, 1 vol., 8vo., 1822
Lyell's Principles of Geology, 2 vols., rl. 8vo., 1867-68
Phillip's, Professor, Manual of Geology, 1 vol., 8vo., 1855
Ramsay's Physical Geography of Great Britain, 1 vol., 8vo., 1864
Southall's, J. C., L.L.D., Epoch of the Mammoth, 1 vol., 8vo., 1878
Memoirs of the Geological Survey of Great Britain, 2 Nos.

PAMPHLETS.

Carruthers, On Osmundites Dowkeri from the Eocine of Herne Bay
Dowker, G., On the Chalk of Thanet and East Kent
Owen, On the Skeleton of an extinct Sloth, Mylodon Robustus, 1 vol., 4to., 1842
Portlock's Geological Report on Londonderry, &c., 1 vol., rl. 8vo., 1843
Whitaker's, W., List of Works on the Geology, Mineralogy, and Palæontology of the Hampshire Basin
Ditto, Introductory Lectures School of Mines, 1851-53

PERIODICALS.

The Geological Magazine
The Geologist from 1852
Quarterly Journal of the Geological Society from 1864, vols. 20

MISCELLANEOUS.

Barclay on Life and Organization, 1 vol., 8vo., 1822
Busk's Reports on Zoology, Ray Society, 1 vol., 8vo., 1843, 1844,
Carpenter's Comparative Physiology, 1 vol., rl. 8vo., 1851
Dallas's Animal Kingdom. 1 vol., 8vo.
Davis On Preparing and Mounting Microscopic Objects, 1 vol., 12mo.
Gosse's Evenings at the Microscope, 1 vol., 8vo., 1859
Ditto Marine Zoology, 2 vols., 12mo., 1855-56
Hart's, Rev. H. M., World of the Sea, 1 vol., rl. 8vo., 1869
Haughton's Three Kingdoms of Nature, 1 vol., 8vo.
Hewson's W., F.R.S., Works, edited by G. Gulliver, F.R.S. 1 vol., 8vo., 1846
Jones', Rymer, Outlines of Animal Kingdom, 1 vol., 8vo., 1861
Knapp's Journal of a Naturalist, 1 vol., 8vo., 1830
Leach's Zoological Miscellany, 1 vol., 8vo., 1814
Newport's, G., Miscellaneous Works, 1 vol., 4to.
Owen's Comparative Anatomy, 3 vols., rl. 8vo., 1866
Pulteney's Life and Writings of Linnæus, 1 vol., 4to., 1805
Quekett's Lectures on Histology, &c., 2 vols., 8vo., 1852-54
Rusticus's Natural History of Godalming, 1 vol., 8vo., 1849
Siebold on Parthenogenesis, 1 vol., 8vo., 1857
Swan's Nervous System, 1 vol., 4to., 1864

Thompson's Wyville, Depths of the Sea, 1 vol., 8vo., 1873
Ditto Second Voyage of the Challenger, 2 vols., 8vo., 1876
Wallace's, G., Malay Archipelago, 2 vols., 8vo.
Wallace's, G., Distribution of Animals, 2 vols., rl. 8vo., 1876
Wells' Essays by and a Memoir of his Life, 1 vol., 8vo., 1818
White's Gilbert, Natural History of Selborne, 1 vol., 8vo., 1875
Micrograhpic Dictionary, 1 vol., with vol. of plates

PAMPHLETS.

Guldberg et Waage's Etudes sur les Affinités Chimiques
Gulliver, G., F.R.S., Review of Works by Goodsir and others
Kingsford, T., Reminiscences of Animals, Birds, Fishes, and Meteorology, 1 vol., 8vo.
Newport, G., F.R.S., Ten Papers by, 1 vol., 4to.
Reade, Rev. J. B., F.R.S., The Diatom Prism, &c.
Saxe, S. A., Le Glacier de Boinon
Wallich, Dr., Seven papers by
Ditto, Eight papers by
Ten papers from the Royal University of Christiania.
Seven papers ditto ditto ditto

PERIODICALS.

Annals and Magazine of Natural History
Land and Water, 9 vols., 1866-70
Magazine of Natural History, from 1859, except vol. for 1862
Monthly Journal of the Royal Microscopical Society
Natural History Review, vol. 3, 1863, and vol. 4, 1864.
Natural History Repertory, 1865
Nature, 6 vols., 1875 to 1877, 4to
The Quarterly Journal of Microscopical Science, from 1859, except vol. for 1862
Quarterly Journal of Science to 1869
Science Gossip, 1870 to 1876, 4to., 7 vols.
Zoologist from 1843 (vol. for 1862 incomplete)

REPORTS.

Cardiff Naturalists' Society Report and Transactions
Croydon Microscopical Club, 6 Reports
Eastbourne Natural History Society, 1871-72, 1874-5, 1875-6
Folkestone Natural History Society, 1871
Ditto Microscopical Club, 1871
Quekett Microscopical Club, June, 1874
Wellington College Natural Science 1872-3, 1873-4, 1874-5
West Kent Natural History Society 1871-2
Ditto West Kent Microscopical and Photographic Society
Zoological Society's Report of Council, 1877

PERIODICALS TAKEN IN BY THE SOCIETY.

Annals and Magazine of Natural History
Geological Magazine
Publications of the Ray Society
Quarterly Journal of the Geological Society
Quarterly Journal of Microscopical Science
Science Gossip
The Zoologist

The Librarian requests that Members taking Books or Periodicals from the Library will be careful to enter the same in the book kept on the table for the purpose, with the dates, "when borrowed" and "when returned."

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EAST KENT NATURAL HISTORY SOCIETY.

TITLE & OBJECTS OF THE SOCIETY.

The objects of the East Kent Natural History Society shall be the Collection and Diffusion of Practical and Theoretical Knowledge respecting Natural History, in all its Branches, both in relation to the particular District and the General Science.

RULES AND REGULATIONS.

MEMBERSHIP.

1. The Society shall consist of Ordinary, Honorary, and Corresponding Members, and of Associates.

2. Every candidate for admission into the Society as an Ordinary Member must be proposed in writing by two Members, and the election shall be by show of hands or by Ballot, taken at any Meeting of the Committee, or at a general Meeting—one negative in five votes to exclude.

3. The Annual Subscription to be paid by Ordinary Members shall be Ten Shillings; the Subscription shall become due on the 1st of January in each year, and shall be paid in advance for the current year. Any Member neglecting to pay his Subscription for three months after it is due, shall be applied to by the Treasurer or Secretary, and if the Subscription remain unpaid for three months after such application, he shall cease to be a member of the Society.

4. The Committee shall have power to admit, without ballot, on the nomination of two Members, any Lady who shall be desirous of becoming an Ordinary Member, and her Subscription shall be Five Shillings. This rule shall apply also to such sons, brothers, and nephews of Ordinary

Members, as may be regularly resident in the same house with those Members.

5. Any persons distinguished for their researches in Natural History, for their liberality to the Society, or for their connection with similar Societies, may, on the recommendation of the Committee, be elected Honorary or Corresponding Members of the Society, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subject to any of the expenses of the Society, and shall have no vote in its affairs, nor be entitled to take books out of the Library, or to the Reports and Notices.

6. In order to cultivate the study of Natural History among individuals of the class of Mechanics, &c., residing in the district, the Committee shall have power to admit individuals of that class as Associates, provided they shall first communicate some information or observation on Natural History, exhibit such specimens or present them to the Local Museums, as shall by their merits satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

MANAGEMENT AND BUSINESS MEETINGS.

7. The affairs of the Society shall be conducted by a Committee of Management, which shall consist of a President, Vice-Presidents, a Treasurer, and an Honorary Secretary, with not less than six Members, who shall all be chosen at the Annual Meeting. Three Members of such Committee shall form a quorum. The Meetings shall be held at four o'clock p.m. on the 1st Saturday in every month, and at such other times as the Secretary may deem necessary. At any regular meeting including a sufficient number of Committee-Members, they may then and there declare themselves and act as a Committee in the ordinary business of the Society.

8. An Annual Meeting shall be held at four o'clock p.m., on the last Tuesday in January, in each year, at Canterbury, for the purpose of electing the officers for the current year, receiving the Annual Statement of Accounts, and Report of the Committee, and conducting the general affairs of the Society. In case of necessity, the Committee may alter the hour, posting due notice thereof in the Society's room.

9. Special General Meetings may be summoned by the Committee, or by the Secretary, on the requisition (in writing) of any six Members of the Society, the specific purpose of the Meeting being stated in the notice, which shall be sent to each Member not less than one week before the time of such Meeting.

10. All questions discussed at the Meetings shall be decided by a majority of votes; and if upon any question the votes shall be equal, the Chairman of the Meeting shall have the second or casting vote.

11. In the event of any vacancy occurring in the Officers or Committee between the Annual Meetings, the same shall be filled up by the Committee. The two Members who have been longest thereon, and have attended the fewest Meetings thereof, during the preceding year, shall go out by rotation at the Annual Meeting.

12. In order to facilitate the objects of the Society, the Committee shall be empowered to appoint any Member a Local Secretary for the town or district he may reside in. Such Local Secretary shall be *ex-officio* a Member of the Committee.

SCIENTIFIC MEETINGS AND EXCURSIONS.

13. The Meetings of Scientific Business shall be at Seven o'clock p.m., on the first Wednesday of every month, at Canterbury; also extra Meetings at such place and time as the Committee shall have posted due notice of in the Society's apartment. Each Member to have the right of introducing a Visitor at these Meetings.

14. There shall be ordinary Excursions on the Afternoon of the day of each evening Scientific Meeting, and at other times, if the Committee so appoint, time and place to be duly notified in the Society's room by the Committee; and Special Excursions at such times and places as may be approved by the Committee, who shall consider written suggestions of Members on the subject.

15. Minutes of the proceedings of all Meetings shall be entered by the Secretary in a book kept for that purpose.

16. The Secretary to give seven days' notice of Special Excursions to every Member, stating the time and place thereof, &c.

LOCAL OR DISTRICT MEETINGS.

17. To promote still further the objects and interests of the Society Local Secretaries and Members are invited to organize Meetings or Excursions in their district; and to give notice of the same to the General and all the Local Secretaries; stating the time and place of Meeting, and what particular subjects are to be brought forward.

COLLECTION OF SPECIMENS.

18. The Society as soon as it may possess sufficient means, shall

endeavour to make a Collection of Objects of Natural History, both with a view of forming a Museum and distribution of Duplicate Specimens according to the Regulations to be adopted by the Committee.

LIBRARY.

19. Only Books and Periodicals connected with Natural History are to be purchased by the funds of the Society, and the number and particular books of this class to be purchased shall be determined by the Committee.

20. All the Books and Periodicals shall be kept in some convenient place, so that Members shall be able to refer to them or take them out under such regulations as the Committee from time to time may think proper to make.

21. Members are also invited to lend Books for the use of the Library, reserving to themselves the full right of ownership; such Books to be under the care of the Committee, and not allowed to be taken out of the Library.

22. In order to allow the Librarian to examine the Books they must all be returned to the Library and none taken thereform during the first week in every June.

EAST KENT NATURAL HISTORY SOCIETY.

January 2nd, 1878,

Among the various subjects of natural history exhibited were some rather large and beautiful Amœbas, taken from Reed Pond by Mr. Dean. The Amœba is an interesting subject to the microscopist, as the entire life history of this curious animal has not yet been fully made out. The Amœbas are minute gelatinous beings found in our fresh water, which have long been a puzzle to, and a fruitful theme of discussion among, naturalists. These creatures appear under a good glass like minute patches of transparent jelly, having, under ordinary circumstances, a diameter of from 1-300th to 1-600th of an inch, but remarkable for perpetually changing their form—at one time shrinking into the appearance of a little globe, then expanding into a flattened radiating disc, and again shooting out portions of their substance in various directions, so as to assume all sorts of shapes with the greatest facility, deserving well the names of Proteus and Amœba bestowed upon them by zoologists. Their manner of multiplication is marvellous. One Amœba has been seen to divide itself into seventeen independent creatures. Amœbiform beings are not necessarily of an animal nature ; for some have latterly been proved to occur in the cycle of development of some of the simplest plants.

Mr. Hammond exhibited a few slides of leaves of plants prepared and mounted by a fresh process for the microscope. In a leaf of the common garden balsam the structure could be well made out, viz., the cells of the epidermis showing stomata, or breathing pores, by which the plant inhales the carbonic acid from the air, which afterwards is split up in the cells containing chlorophyll, the carbon being made use of to help form various substances, as cellulose, starch, sugar, etc. ; and the oxygen being again given up to the air. Also the bundles of vessels, and cells containing different crystals, long and short raphides in bundles, sphæraphides, dotted here and there all through the leaf, and the peculiar bodies called cystoliths by the French botanists, these hang by a stalk from the cell wall, the cell

containing them being very large. Cystoliths have one peculiarity, they are quite indifferent to polarised light, all other plant crystals give brilliant results with this illumination.

Rainfall at Milton Chapel for 1877.

January	5·825	inches.
February	1·534	,,
March	2·711	,,
April	2·597	,,
May..........	2·56	,,
June	1·262	,,
July	2·818	,,
August	2·340	,,
September	1·395	,,
October	2·370	,,
November	6·13	,,
December	2·848	,,
	34,390	

The greatest heat registered in the shade.

June 4th	86°	Fah.
July 31st	86°	,,
Aug. 19th and 20th	80°	,,

The greatest cold.

February 28th....	25°	Fah.
March 9th	24°	,,
March 10th	21°	,,
October 17th	26°	,,
December 10th ..	26°	,,

February 6th, 1878.

Plant-Crystals.—Upwards of forty drawings of raphides and other microscopic plant-crystals, systematically arranged, with observations thereon, were submitted to the Society by Professor Gulliver, F.R.S. These drawings are intended to form two plates in the forthcoming new edition of Professor Lionel Beale's valuable book, entitled "How to work with the Microscope." The *Raphides* were shown detached and naked, next in the ovule of a plant, then in special cells and in intercullular spaces devoid of any such cell ; and lastly escaping from both ends of their cell, so as to present the forms called "biforines" by French botanists ; and in a separate drawing were shown the rounded needle-like shape of the shafts and the pointed ends of the raphides.—The *Sphæraphides* were depicted either smoothish, granular, or stellate on the surface ; sometimes suspended by a stalk in a cell, so as to form the "cystoliths" or "crystal glands" of some phytotomists ; sometimes occupying either the centre or corner of every cell in a tissue of cells, arranged together like tesselated or mosaic work.—No less than fourteen figures were drawn of *Long Crystal Prisms*, which differ from true raphides in being really prismatic and not cylindrical, and in occurring impacted, singly or only two or more soldered together, in the plant-tissue.—The *Short Prismatic Crystals* were shown in the testa or seed-skin of several plants ; in the leaves, calyces, and pods of Legumens ; in the leaf-stalks of the orange

and lemon, and of the poplar and allied trees ; in the ovary of Compositae, &c.

The significance of these crystals, which had been discussed at former meetings of the Society, does not seem to have been recognised in our books of botany and philosophical agriculture. Some of the drawings now presented are quite new, and altogether they suggest interesting and important views in physiological botany. The crystals are composed in great part of salts of lime, and must, when restored to the soil in the decayed leaves and other parts, serve as valuable manure, and when eaten in the fresh or dried plants by animals form an essential constituent of their frame. The quantity of the crystals is immense in the Legumens, which are so valuable as fodder ; in the seeds or fruits so much fed on by birds ; and even in the duckweeds, which form much of the food of the young aquatic birds and of many groups of invertebrates. And no doubt, when this minutely divided crystalline matter in the plants is taken by animals as aliment, it is in the most favourable state for assimilation with the bones or other tissues ; so too when restored to the earth in vegetable humus it forms a very valuable manure, always highly esteemed in the state of leaf-mould by the gardener. The same reasoning will apply to medicine. Thus, for example, Sarsaparilla has long been known for its efficacy, especially in such kinds of cachexy as are connected with diseased bones ; and the best samples of this plant afford abundance of raphides, which, according to the analyses of Dr. Davy, consist mainly of phosphate of lime. A considerable quantity of starch also occurs in Sarsaparilla ; and so no wonder that some of our most eminent surgeons, like the late Sir Benjamin Brodie, found it most useful in large doses. But the reason why never so plainly appeared as since the researches on these crystals, nor indeed of several of their important functions in the economy of nature. It is remarkable, too, how valuable characters in systematic botany are proved to be afforded by raphides, as described at former meetings of the Society. And the true Sarsaparilla may be thus easily distinguished from the false. This latter, often called American Sarsaparilla, contains numerous sphaeraphides—as do the allies of its order, Araliaceae—but no raphides at all.

No adequate descriptions and figures have yet been published of the physiological significance and marvellous distribution and forms of plant-crystals. They are often surprisingly beautiful, and may well afford inexhaustible subjects at all seasons for the employment of the microscope. Were we to describe a tree as invested throughout by a most delicate network of microscopic crystals the description might seem to be rather wild imagination than sober reality. It is nevertheless the strict truth, as these researches have plainly

demonstrated. Take, for instance, the Aralia spinosa, which is common on our lawns or in other ornamental plantations, and examine it from the base of its trunk to the extreme branches and tips of its leaves ; and beneath the outer bark or epidermis will be found this network. Thus may a tree be enveloped by an amazingly fine and beautiful web of crystalline cells, as admirably regular as mosaic or tesselated work. In such cases the studs of crystal are usually stellate sphæraphides ; but the arrangement of the short prismatic crystals throughout the plant may be scarcely less wonderful. These short prismatic forms are often spread out into a similar tissue, and are oftener observed in chains of cells along the vascular bundles of the leaves, so as to form a fine internal crytalline skeleton in the plant ; as may be well seen in numerous species, of which the common white clover and many other Legumens are good examples. In fact, the whole subject of these plant-crystals might form a profitable addition to old Erasmus Darwin's great work, entitled "Phytologia, or the Philosophy of Agriculture and Gardening," published in 1799, or matter for investigation by the Agricultural College at present flourishing in the West of England. From some experiments made by Mr. Hammond, of Milton Chapel, it appears too that several of the crystals polarize light beautifully ; and a wish was expressed that he would continue and extend his observations on this novel and interesting point, and communicate them to the scientific meetings of the Society. Indeed, microscopic crystals belong to the vast province of the cell-biography of plants, hitherto so much neglected that even its great taxonomic value is still ignored in the books of botany. But it is sufficiently plain in the book of nature, and must be diligently studied there, both systematically and physiologically, before we can hope for a discovery of the most complete diagnostic characters and laws of the vegetable kingdom.

The drawings were admirably illustrated by Mr. Hammond, in a series of slides of the real objects, skilfully prepared for microscopic examination. All the forms of the crystals were thus shown, much to the pleasure and profit of the meeting. He gave abundant proofs of the fact, which has been doubted by some botanists, of the occurrence together of two or more forms of the crystals in the same leaf of one plant, in accordance with Mr. Gulliver's observations. In particular, in the leaf of the mulberry, as discovered in this species by Mr. Hammond, the short prismatic crystals were shown lying in chains along the vascular bundles, while sphæraphides were seen at the same time, and in one microscope field, dotted about the blade of the leaf.

May 1*st*, 1878.

The following very interesting and valuable paper was read by W. H. Hammond, Esq., of Milton Chapel :—

A method of examining the crystals *in situ* in the leaves and other parts of plants : Ever since I first began to use the microscope, Plant Crystals have been objects of interest to me, not only on account of their great beauty as "objects," especially with the polariscope, but also because they open a new and comparatively unexplored region of phytotomy ; in fact, except in Professor Gulliver's writings, they are hardly mentioned, or very summarily dealt with, by other botanical writers. At first I used to be content with a sight of them, after boiling and washing parts of plants, but I soon became dissatisfied with this method, and began to look about for some means of examining the crystals just as they grew in the different plants. Fortunately I happened to look at a back number (January, 1875) of "Science Gossip," and came across a paper by the late Dr. Beatty, "On decolouring and staining vegetable tissues for microscopical examination ;" other papers by Dr. Beatty came out afterwards, and I obtained many hints from them on the subject. I am often asked how my preparations are made, so I will describe my process of preparing and mounting for the benefit of other workers with the microscope, who are interested in these interesting, but much neglected, marvels. The first thing to be done is to get the bleaching solution, and this may be very easily prepared as follows: Equal weights of chlorinated lime and common washing soda, both in fine powder, are put into a half-gallon bottle of cold water, and well shaken together, then left to stand till the fluid is quite clear; this is poured off gently into another bottle, and a strong solution of washing soda added, as long as a white powder is thrown down. The mixture is again left to stand till clear, and then poured off ; this is the bleaching fluid. The original substances in the first bottle may be again treated with cold water. Leaves and other tissues are put in this liquid till bleached and semi-transparent ; large or thick leaves are best cut up into small pieces. I find the small round night-light glasses, which may be bought for less than a penny each, are very convenient for bleaching the tissues in and also for dyeing and subsequent soakings, covering them over with pieces of glass. It is not always convenient to prepare mount leaves directly they are gathered, so I always carry an interleaved (with blotting paper) pocket book with me, with an elastic band round it. Leaves are put into this when gathered, and by carrying it in the breast pocket of the coat, they are soon dried by the warmth of the body. In the summer time several books full of leaves are collected ready for the long winter even-

ings; dried leaves will bleach sooner than fresh gathered ones. Having bleached some leaves (the time it takes to do this varying very much), they must be well washed in warm water, in basins or pie dishes, changing this often, for about two days; they should then be well brushed with soft camel hair brushes, and I often find it of use to put them into acetic acid and water for about a minute, before the final washing, but acids must be very cautiously used or the crystals may be dissolved. The leaves are then ready to go into either of the following dyes. The carmine dye is prepared partly according to Dr. Beales' formula, viz.:—Carmine, 20 grains; strong liquor ammonia, ½ dram; pure water, 4 ounces. The carmine is heated in a test tube with the ammonia till dissolved, and then added to the water in a bottle, well shaken and left to settle or be filtered. The dye should smell strongly ammoniacal. Sections are soon dyed in the above, but leaves often take several days or a week. Sections of the India rubber plant leaf or of the common fig, dyed in carmine, will show the stalked crystals, called cystoliths, very nicely; pieces of the leaves of fig, hop, nettle, wall pellitory, wych elm, dyed, will show the cystoliths when viewed from above or below. I generally mount two leaves or pieces on the same slide, one with the superior and the other with the inferior surface uppermost. The logwood dye is prepared according to the prescription in "Rutherford's Histology":—A. Make a saturated solution of calcium chloride in 70 per cent. alcohol, and then add alum to saturation. B. A saturated solution of alum in 70 per cent. alcohol. C. Add A to B in the proportion of one to eight. D. A barely alkaline saturated solution of logwood in water. Add D to C till a deep violet coloured dye is obtained. I make D by boiling logwood chips with water and a little potash, then filter. The leaves and tissues may be immersed in this from the last wash water, and will be dyed in about the same time as the ones in carmine. Leaves when dyed, either with carmine or logwood, must be taken out and well washed and brushed in about two wash waters, then dip those dyed in carmine into acetic acid and water for about a minute; those dyed in logwood in alum and water, then wash again. The remaining operations will be described further on. I also use a blue dye made by pouring six or eight drops of Judson's analyne blue into an ounce of methylated spirit, shaking and filtering. Leaves and sections to be dyed in this must be soaked in methylated spirit for about a day, after being taken out of the last wash water. After dyeing they must be washed and brushed in methylated spirit. Leaves generally require to be kept in this dye for several days. Leaves and sections, after undergoing these operations, may either be mounted in Deane's gelatine medium or in dammar or balsam dissolved in benzole. I like to

have specimens of the same kind of leaves dyed in all three colours and mounted both ways, or only the blue dyed one in balsam or dammar. Leaves or sections which are to be mounted in Deane's medium should, after the final washing, be put into the following solution for about two days, as directed by Mr. Deane:—Rectified spirit 1½ ounces; pure water, 1½ ounces; pure glycerine 5 drams. Take the tissues out of the above fluid, drain off as much as possible, and mount in the medium. I prefer this way of mounting for most leaves, for this reason, it does not make the leaves so very transparent as dammar or balsam does, and generally every cell wall is distinctly seen, the crystals, the hairs, and every other part of the leaf. Leaves to be mounted in dammar or balsam should be thoroughly dried from the last washing, after dyeing; this is best done by putting them in one of the interleaved books before mentioned for a day or two, and when thoroughly dry take them out and put them into a small wide-mouthed bottle, and pour over them benzine enough to cover them (benzine collas is much the best), and leave them to soak till perfectly transparent, then take them out, drain, but not dry, and mount quickly in the balsam or dammar dissolved in benzine. Leaves mounted in this way are beautiful objects for the polariscope if they contain crystals or have any hairs upon them, but they are nearly always so transparent that the cell walls are quite obliterated. Good leaves to experiment upon are chickweed, mercury, and wild strawberry, for sphæraphides. For long crystal prisms, the outer skin of the gladiolus bulb, sweet orris root, and leaves of the blue flag, also the outer skin of garlic and onion. For short prismatic crystals, clover, sanfoin, beech, and trefoil. For true raphides, squill bulb, leaf of hyacinth, blue bell, lemna trisulca, balsams, willow herb, fuchsia, evening primrose, and arum. Cystoliths.—Leaves containing these should not be mounted in dammar or balsam, as they do not polarise, and are generally rendered invisible by this way of mounting. No one need be afraid of not getting specimens, for I believe the greater part of our plants contain crystals of one kind or other, and they may be well and easily studied *in situ* by mounting in Deane's medium, after properly preparing and dyeing, but they may be often very well seen by simply bleaching, washing, and examining in water. And I may add that the crystals afford an abundance of beautiful materials for the microscope, and that the more they are studied the more they will be admired. Their taxonomic and physiological significance too is an important subject for further research, concerning which Professor Gulliver has given the results of extensive observations. He recommends boiling the plant tissues in a solution of caustic potass; this is an easy way of exposing the crystals and their cells, though

by no means so effectual in the preparation of beautiful and instructive slides as the methods which I have attempted to describe.

Captain McDakin exhibited some foliated crystals of heavy spar or sulphate of Baryta, from the interior of a septaria, found in the London clay of the Isle of Sheppy. This mineral, although not unknown in the formation, is not mentioned either by Lyell or Phillips, or by Farady in his analysis. The nodular bodies called septariæ are so well known on the coast of Kent from Whitstable to beyond Herne Bay, and especially on the coast of Sheppey, that they need little comment. Off the coast near Harwich they have been dredged up for some time for the purpose of making Roman cement. Their most striking characteristics are the septa, or divisions of carbonate of lime, which give them a rough cellular structure, becoming very apparent when they are sawn into slabs and polished, for the tops of ornamental tables. They seem to be seggregations of carbonate of lime from the surrounding beds, very frequently around some organic remains, such as a shell, coral, teredo, bored wood, &c., bearing some analogy to the flints in the chalk and hornstone in other rocks, for as the flints or silica have separated out from the surrounding chalk into nodules containing sponges, echini, &c., in like manner have the septariæ been formed by carbonate of lime separating out from the surrounding silica and alumina constituting the principal part of clay. No mention is made by Farady in his analysis of London clay and septariæ of baryta or its sulphate, which is one of the most insoluble of minerals, being in most text books of chemistry called insoluble, but some mineral waters contain as much as one part in seven hundred thousand. Such a mineral stream flowing into the sea would be so diluted that the molecules of sulphate of baryta would become so far apart that we can but wonder at the strange property of matter which chemists call affinity that caused them to seek out each other from among a multitude of particles of a different nature, reminding one of that higher power of selection which in the animal kingdom takes the form of instinct. From a rough analysis of these crystals I find them to be pure sulphate of baryta, the silica, alumina, and oxide of iron, arising from particles of clay entangled among the crystals

August 7th, 1878.

Mr. Fullagar exhibited a specimen of the large saw fly (Tenthredo), on which a few remarks were made, explaining something of the wonderful instrument from which it derives its popular name of saw fly. The insect was caught by Mr. Bateman, St. George's-street, in his studio. It can hardly be called

a British species, being probably imported in the larva state in foreign timber, and, so far as is known, not multiplying here. We find in the instrument from which the saw fly derives its name, one of the most beautiful of all the contrivances that have been observed for the placing of the eggs of insects, an instrument from which (if the chronology of arts and sciences would allow us to believe that optics had ever been in advance of mechanics) we might suppose that man had borrowed not the idea only, but the perfect pattern of the saw fly. This instrument is a very curious object, and in order to describe it, it will be proper to compare it with the tenon saw used by cabinet makers, which, being made of a very thin plate of steel, is fitted with a back to prevent its bending. The back is a piece of iron, in which a narrow and deep groove is cut to receive the plate, which is fixed. The saw of the Tenthredo is also furnished with a back, but the groove is in the plate, and receives a prominent ridge on the back, which is not fixed, but permits the saw to slide forward or backward as it is thrown out or retracted. The saw of artificers is single, but that of the Tenthredo is double and consists of two distinct saws with their backs. The insect, in using them, first throws out one, and, while it is returning, pushes forward the other; and this alternate motion is continued till the incision is effected, when the two saws, receding from each other, conduct the egg between them into its place. In the artificial saw the teeth are alternately bent towards the sides, or out of the right line, in order that the fissure or *skerf* may be made sufficiently wide for the blade to move easily. To answer this purpose in some measure, in that of the Tenthredo the teeth are a little twisted, so as to stand obliquely with respect to the right line, and their point of course projects a little beyond the place of the blade without being laterally bent, and all those in each blade thus project a little outward. But the skerf is more effectually made and a free range procured for the saws, by small teeth placed on the outer side of each, so that while their vertical effect is that of a saw, their lateral effect is that of a rasp. In the artificial saw the teeth all point outwards (towards the end) and are simple, but in the saw of the Tenthredo they point inwards or towards the handle, and their outer edge is beset with smaller teeth which point outwards (towards the end).

Captain McDakin drew the attention of the Society to a Septaria from the Weald Clay of the Isle of Wight, containing fifty-two per cent. of sulphate of barytes. In comparing this with a septaria from the London Clay, also containing barytes and exhibited on a previous occasion, attention was directed to the difference of the two formations, the London Clay being a marine deposit while the Weald

Clay is a freshwater one. The former, belonging to the tertiary period, occurring in a great depression to the north of the North Downs, and in another to the south of the South Downs, abounding in marine remains as well as fossil wood swept from the land, tells of a more purely marine origin than the older Weald Clay, of the secondary period, the fossils from which are of a freshwater type, Paludinæ and Cyclas being characteristic shells, containing beds of marble apparently deposited in old lake bottoms in what was once the surface of the clay, and known as the Bethersden and Petworth marbles,—fine examples being afforded by some of the old altar slabs of the churches in the neighbourhood, subsequently converted into tomb stones or steps. The local formation of the Weald occupies a central position between the North and South Downs, and, passing under the tertiary and cretacious rocks of the South Downs, re-appears in the Isle of Wight, from whence the mineral exhibited was obtained. We are indebted to the labours of Dr. Mantell and his wife for much of our knowledge of this formation. Their names will be for ever associated with that gigantic lizard, the Iguanodon, which being more than thirty feet in length and twenty in circumference, is more charming as a fossil than it could ever have been as a living specimen. To the west the Wealden sinks under the lower greensand and chalk of Hampshire. To the east, on the opposite side of the Channel, it shows itself near Boulogne. In these days, when gunnery has attained a development that even a few years ago would have been thought impossible, it is not uninteresting to remember that the first cast-iron gun made in this country was cast at Buxted, on the borders of Kent, in Henry the Eighth's reign, from iron obtained in the Weald, and melted by the charcoal furnished by the forests, that have given the name of Woodland, Wold, or Weald to the district, and to this remarkable geological formation.

September 4th, 1878.

The following very interesting paper was contributed by Colonel Horsley:—

Some two or three years since I exhibited to the Society a specimen of "Lythrum salicaria," which I had found growing by the side of the dyke on the road leading from St. Stephen's to Broad Oak and Herne. I at that time compared it with the coloured plate and description of the same flower, given at p. 67, of Dr. Lindley's Ladies' Botany, vol. II., and found it differed in one or two important points, viz., in the anthers and pollen of the six longer stamens, which, in the plate, are both coloured yellow, while in my specimen the anthers were purple and the pollen emerald green. The six shorter stamens were, in both instances the same, *i.e.*, both had

yellow anthers and bright yellow pollen. I also noticed a difference in the size of the yellow and green pollen respectively, the former measuring 1-800th inch in length and 1-1,600th in breadth, and the latter 1 600th inch in length and 1-1,200th in breadth.

I asked for information as to whether it was the yellow or the green pollen or both of them which served to fertilize the flowers, but could learn nothing certain about it, until I happened very lately to come across Darwin's work, entitled "Forms of Flowers," and there, at page 137, I found a full description of the plant with explanatory figures.

I find he speaks of three forms, which he calls respectively, the long-styled, the mid-styled, and the short-styled forms. Diagrams of the three forms are given at page 139.

On comparing these with some specimens which I brought home from the same dyke on the 2nd instant, I find we have these three forms growing in close proximity to each other—and answering exactly to the description given by Darwin—as follows:—

Long-styled form.—This form can be at once recognised by the length of the pistil, which is (including the ovarium), fully one-third longer than that of the mid-styled, and more than twice as long as that of the short-styled form. It is so disproportionately long, that it projects in the bud through the folded petals. The globular stigma is considerably larger than that of the other two forms with the papilla on its surface generally longer. The six longer stamens project about two-thirds the length of the pistil, and correspond in length with the former. The six shorter stamens lie concealed within the Calyx; their ends are turned up, and they are graduated in length so as to form a double row. The anthers of these stamens are smaller than those of the longer ones. The pollen is of the same yellow colour in both sets.

Mid-styled form.—The stigma is seated between the anthers of the longer and shorter stamens. The six longer stamens correspond in length with the pistil of the long-styled form—their filaments are coloured bright pink; but from containing bright green pollen, and from their early dehiscence, they appear emerald green. Hence in general appearance these stamens are remarkably dissimilar from the longer stamens of the long-styled form. The six shorter stamens are enclosed within the calyx and resemble in all respects the shorter stamens of the long-styled form; both these sets correspond in length with the short pistil of the short-styled form The green-pollen grains of the longer stamens are to the yellow pollen-grains of the shorter ones as 100 to 63.

Short styled form.—The pistil here is very short, not one-third of the length of that of the long-styled form. It is enclosed within the calyx, which, differently from that in the other two forms, does not enclose any anthers. The six longer stamens, with their pink filaments and green pollen, resemble the corresponding stamens of

the mid-styled form. But, according to H. Muller, their pollen-grains are a little larger. The six shorter stamens, with their uncoloured filaments and yellow pollen, resemble in the size of their pollen-grains and in all other respects, the corresponding stamens of the long-styled form. The difference in diameter between the grains from the two sets of anthers in the short styled form is as 100 to 73.

We thus see that this plant exists under three female forms, which differ in the length and curvature of the style, in the size and state of the stigma, and in the number and size of the seed.

On the power of mutual fertilisation between the three forms, Mr. Darwin states as follows:—"Nothing shows more clearly the extraordinary complexity of the reproductive system of this plant than the necessity of making eighteen distinct unions in order to ascertain the relative fertilising power of the three forms. Thus the long-styled form has to be fertilised with pollen from its own two kinds of anthers, from the two in the mid-style, and from the two in the short-styled form. The same process has to be repeated with the mid-style and short-style forms. It might have been thought sufficient to have tried on each stigma the green pollen, for instance, from either the mid or short-styled longer stamens, and not from both; but the result (of Mr. Darwin's experiments) proves that this would have been insufficient, and that it was necessary to try all six kinds of pollen on each stigma."

Those who wish for further information in connexion with this interesting plant should refer to the book itself, which I have purchased for the Society's library. Suffice it to say that a specimen of each form is now on the table for the inspection of the members. The two kinds of pollen form a very pretty subject under the microscope.

Miss Marsh, of Tunbridge Wells, brought to the notice of the Society some specimens of Lythrum salicaria, obtained from the river side near the Milton Railway Bridge, which in two instances showed the peculiarities mentioned in Colonel Horsley's paper. Mrs. Terry laid upon the table some beautiful minerals, which excited great admiration. Mrs. Pilcher, of St. Dunstan's, contributed several fine specimens of the Enchanter's Nightshade. Mr. Henry Dean sent a bottle of water containing Volvox and Actinophrys, for microscopical observation.

October 2nd, 1878.

Colonel Horsley read the following very interesting paper "On the carnivorous habits of the Utricularia minor":—

Charles Darwin, D.C.L., F.R.S., in his work on Insectiverous Plants, 1875, gives most interesting information on the subject of "Utricularia." He mentions several species of this plant, among

them Utricularia neglecta, Vulgaris, minor, Clandestina, &c., and gives the results of experiments as well as diagrams of the bladders which offer the chief point of interest. Having been furnished some time back by Mr. Dean, of St. Peter's-street, Canterbury, with a specimen of what I believe to be "Utricularia minor," I placed it in a small aquarium with river water, in which duck weed and other aquatic plants were growing, and it has increased considerably since then. Mr. Darwin's remarks on this species are as follows:—This rare species was sent me in a living state from Cheshire. The leaves and bladders are much smaller than those of "Utricularia neglecta." The leaves bear fewer and shorter bristles, and the bladders are more globular. The antennæ instead of projecting in front of the bladders are curled under the valve, and are armed with twelve or fourteen extremely long multicellular bristles, generally arranged in pairs. These, with seven or eight long bristles on both sides of the peristome, form a sort of net over the valve, which would tend to prevent all animals, excepting very small ones, entering the bladder. The valve and collar of the bladder have the same essential structure as in Utricularia neglecta and vulgaris; but the glands are not quite so numerous; the oblong ones are rather more elongated, whilst the two-armed ones are rather less elongated. The four bristles which project obliquely from the lower edge of the valve are short Their shortness, compared with those on the valves of the two species mentioned above, is intelligible if my view is correct that they serve to prevent too large animals forcing an entrance through the valve, thus injuring it; for the valve is already protected to a certain extent by the incurved antennæ, together with the lateral bristles. The bifid processes are like those in the above mentioned species, but the quadrifids differ in the four arms being directed to the same side; the two longer ones being central, and the two shorter ones on the outside." Mr. Darwin further remarks, "that the prey found in the bladders consists exclusively of fresh water crustaceans. In one bladder the quadrifids in contact with a decaying mass contained numerous spheres of granular matter, which slowly changed their forms and positions."

The specimen of the above plant which I bring to the notice of the members this evening was, as I have before said, given me by Mr. Dean. He procured it, I believe, in the vicinity of Grove Ferry, but it is also met with near Sandwich. It will be observed that the bladders contain small crustaceans in various stages of decay. To satisfy myself on this point I opened out one or two of them on a glass slide and examined their contents under the microscope, when, sure enough, the skeletons of these animals plainly appeared. These slides I have brought with me this evening, and any members may satisfy themselves as to the nature of the contents.

Animals enter the bladder by bending inwards the posterior free edge of the valve, which from being highly elastic shuts again instantly. As the edge is extremely thin, and fits closely against the edge of the collar, both projecting into the bladder, it would evidently be very difficult for any animal to get out when once imprisoned, and, apparently, they never do escape. Darwin remarks, "To show how closely the edge fits, I may mention that my son found a Daphnia, which had inserted one of its antennæ into the slit, and it was thus held fast during a whole day." For further information concerning this interesting plant I beg to refer the member's to Darwin's work, which is in the Society's library.

In one of the bladders of the specimen before the meeting there are no less than six animals of the genus cypris, having a body enclosed entirely in a covering of two valves, resembling a bivalve shell, belonging to the order "Ostra-coda," from the Greek word signifying a shell. The same bladder also contains a globule of air. The measurements of the bladder are as follows:—Long diameter, 2-25 inch; short diameter, 2-30 inch. The measurements of each separate animal contained therein are:—Long diameter, 1-50 inch; short diameter, 1-75 inch.

Captain McDakin, in communicating some of his experiments on the absorbing power of chalk, dwelt on our present knowledge of its origin and properties, commencing with its position as the concluding formation of the great secondary division when the saurian type of creation gave place, in the next great division, the tertiary, to the more perfectly developed mammal. The chalk being a marine formation the fossils are almost exclusively of that nature, with the few exceptions of drift wood and bones of the gigantic lizards of the land, and not only this, but the whole mass consists of the remains of Foraminiferæ, minute creatures, whose calcareous shells, too small to be easily discerned by the unaided eye, contribute in some instances ninety-eight per cent. of the whole, and in the underlying greensand internal casts in silica of these creatures occur. This is very remarkable, as pointed out by Dr. Carpenter, who has shown that the same process of nature is now going on, forming a white mud at the bottom of the Atlantic, so familiar to readers of his works, as the Globigerina ooze. Below the depth of twelve thousand feet the calcarious particles are re-dissolved and the silicious casts of their interiors take their place, constituting a similar formation in this respect to the green sand of the cretacious period. The importance of these creatures in the earth's economy may be concluded from the estimation that has been made, that all the animal and vegetable life besides is small compared to the immense quantity of life represented by the Foraminiferæ. It furnishes one of those curious analogies that exist in nature, in its similarity to electricity of quantity and intensity; life in these creatures representing quantity, while in the higher animals it may take the form of intensity. Nor

is it less remarkable that whilst the giants of the earth, the huge reptiles of the Mesozoic ages and the no less gigantic mammals of the Cainozoic, have left but their tusks and bones as memorials that they ever lived, and man who has reared the pyramids, constructed railways, dug canals, and built cities, has but dotted and scratched the surface of the earth, these minute creatures have paved the ocean's floor, constructed continents, and upheaval having raised their work above the waters, it stands in many places a thousand feet above the sea. The chemical nature and analysis of chalk having been shown with the aid of diagrams, some of the pure chalk from Shoreham Downs containing ninety-eight per cent. of carbonate of lime, the industrial uses to which it has been put were entered into, the manufacture of cements and some of the properties of common mortar. In connection with the latter it is recorded, as an interesting fact, that mortar analysed by Dr. Malcomson from the interior of the Pyramids, and now perhaps three thousand years old, still contain caustic lime. Captain McDakin stated that from some of his own experiments he found the upper chalk when dry capable of absorbing twenty-three per cent. of water, the lower chalk from Folkestone twenty-one per cent., and the Chalk Marl eleven per cent.; whilst some of the hard grey chalk from the Abbot's Cliff only absorbed eight per cent., showing how, after heavy and continuous rain, falls of chalk from the sea cliffs and railway cuttings are most likely to happen, sometimes bringing about such destructive results as those which took place between Dover and Folkestone not quite two years ago. The architect and builder have also made use of this rock as a building material, examples of which occur in Louth Abbey, Lincolnshire, and St. Pancras priory at Lewes in Sussex; the latter being eight hundred years old, speaks well for its durability. The underground works of Dover Castle also afford an instance of the manner in which it may be excavated on an extensive scale without the use of masonry to hold it up, these galleries in some places being in three tiers.

In concluding, Captain McDakin remarked how so simple, so common a thing as a piece of chalk, when looked into, opened out to the thoughtful inquirer a whole volume of instruction, presenting to the mind the great laws of nature, chemical affinity and vitality acting together to produce results of which they, being non-intelligent, can have no knowledge, created beings working together at their appointed tasks to bring about that which is so far above their immediate requirements, so far above the conditions of their existence that the most unobservant cannot fail to perceive the directing hand of Deity.

November 4th, 1878.

Captain McDakin, in addressing the Society on the subject of the gravel beds of the neighbourhood—after briefly explaining the supposed origin and analysis of flint—referred to Mr. G. Dowker's paper on flints (published with the proceedings of the Society) and stated that it would be going over ground already beaten to occupy their attention longer on this portion of the subject. But he proposed directing it to those accumulations of flints originally derived from the chalk, and now constituting the tertiary pebbles and subangular gravels, the pebbles being the effect of the marine denudation that removed the greater portion of the cretaceous rocks from the Weald, leaving but rolled fragments of the hardest portion of the chalk flints and greensand cherts, a slowly advancing sea leaving those rounded pebbles so remarkably of the same size, form, and colour, now forming the most conspicuous feature of Shottenden Hill, and constituting what are known as the Old Haven pebble beds. The land then sinking into the quieter depths of a deeper sea, the London clay and Bagshot sand were deposited, when re-elevation taking place, the land was covered with the vegetation and animal life of a warm climate, as evidenced by the organic remains of the preglacial period which died out or gradually changed to species adapted to a colder climate, and finally ceased to exist, being driven southward by the advancing cold, until the mountains of Great Britain supported glaciers, and the lower lands were submerged under a sea covered with floating ice. The whole northern portion of the island was in this manner spread over with fragments of rocks and clays, transported by the ice in many instances from long distances. But south of a line passing westward through the valley of the Thames, all this evidence of glacial action ceases until we reach the south coast, when we find imbedded in the sands and shingle large blocks of granite from a few pounds to three tons in weight, as at Bognor, and Hayling island, evidently carried by floating ice from perhaps the Channel Islands or far to the west from Devon or Cornwall. This part of the country must then have been elevated above the glacial sea, and have been covered with an ice cap, the result of the accumulated snows of centuries, which, flowing downwards a few feet or inches in a day, pushed before it the loose pebbles left by the former marine denudation and the angular flints arising from the erosion of the chalk, so sweeping bare of gravels the wealden district of Sussex and Kent, leaving in the bottom of old valleys and on the land-locked shore of inlets, confused masses of sand, gravel, and pebbles. A warmer climate again succeeding (or as Mr. Dawson has put it, the spring time of the Tertiary period) the glaciers melted away, retreating year after

year to the higher levels, leaving patches of gravels as they receded, assorted and re-assorted by rivers and floods, when heavy rains, probably exceeding even those of the tropics at the present time, cut river channels to lower levels, leaving what were once the bottoms of gravel strewn valleys, the tops of gravel capped hills, in some places, as at Maidstone, three hundred feet above the present river level. On the return of a warm climate the animals seem to have again immigrated into this country, the herbivorous being followed by the carnivorous, for we find in some of the "bone caves," as at Kirkdale, the remains of the elephant, rhinoceros, hippopotamus, ox, deer, sheep, goat, &c., with the bear, lion, panther, wolf and bones frequently gnawed by hyenas.

Latterly the makers of flint implements appeared upon this stage of the world's history, and with knives and scrapers of flint resorted to the river sides to prepare the skins of wild animals which they had killed in the chase. All this time the rivers still ran on cutting their channels deeper, widening valleys, and letting fall to lower levels the old glaciated gravels of the hill tops, until we have what some have distinguished as high and low level gravels, the latter being frequently mixed with or covering flint implements as they fell from higher to lower positions on the river sides; and as the carnivorous followed the more harmless herbivorous animals in their immigration, so evil followed man, for many of these rude-shaped flints were doubtlessly the weapons with which the ancient Britons broke each other's heads, as they were also their only means of obtaining fire. Such a mode was witnessed by Captain M'Dakin when travelling in the Himalaya mountains. Some of his followers who possessed tobacco, but neither pipe or the civilised means of producing a light, excavated a small trench in the ground about three feet long and an inch deep; in this they laid the smooth twig of a tree, then filling it in with mud or clay they carefully withdrew the twig, after having formed a small crater at one end to act as a pipe bowl, in which the tobacco of the company was placed, the all necessary fire being produced by striking together two quartz pebbles, in such a manner that the sparks fell on the cotton like pith of a weed, much resembling the Mountain Cudweed, pulled up by the wayside; this being placed in the centre of a ball of dry grass it was waved in the wind till it became a ball of fire. The light thus obtained having been applied to the pipe, the company took turn about by forming a mouth piece of their hands and so inhaled the essence of the weed. In a similar manner the makers of the flint flakes doubtlessly obtained fire, and let us trust that they were thankful for the light that they possessed, although they were without the consolations that tobacco seems to afford their superiors in civilization of the nineteenth century.

December 4th, 1878.

Colonel Cox, in addressing the meeting, said—I wish to point out the two eggs of a lung-breathing snail, the Bulimus hoemastoma. You will see they are quite as large as those of a sparrow; the shell is hard and calcareous. The animal only lays one occasionally. On looking into Knight's Penny Encyclopedia I find the following remarks, which I have extracted, believing that you will feel as much interested as I have been. "The reproduction of this species is by means of eggs, which are white, and have a firm shell like those of birds. Some of these eggs are of considerable size. Three eggs were laid by one of these species—Bulimus ovalis (a specimen of which is on the table) from Rio, in a hot house in the garden of the Royal Horticultural Society at Chiswick. It was brought over in October, 1828, by Mr. William M'Cullock, then gardener to the Right Hon. Robert Gordon, and presented by him to the Society. At first it appeared rather sickly, but after it had been kept in the hot house for some time it recovered and began to move about. Mr. Booth, who was on the spot, says it cannot now be correctly ascertained when it produced its first egg, but it was very shortly after its arrival, I should think about the beginning of November. This egg was sent, by the desire of Mr. Sabine, to the Geological Society. About the same time in the year 1829, it produced a second egg, and three weeks after a third. The latter was unfortunately broken by the animal itself, but the former are still in preservation. It fed upon lettuces and the under leaves of cabbages; the former seemed to be its favourite food. Sometimes it would devour two large lettuces and then remain for days afterwards without touching food or removing from its place, except when cold water was sprinkled upon it. During the day it was usually in a dormant state in the shade, but towards evening, when the house was moist and warm, it would spread itself out and move from one part to another. It seemed to like moisture, and I have no doubt that it might have been preserved for years, if it had not been accidentally killed. On Saturday last it was at the end of the house where the fire comes in, and ventured too far upon the hot bricks after they had been watered. In the morning it was found fixed to them and quite dead."—"Geological Journal," vol. v., p. 102. I have placed before you several varieties of this very interesting group of land shells. Thus, the Bulimus hoemastoma is a large shell, but the ovalis and especially the zebra is very fine. On examining the second and broken egg the young bullen is clearly seen inside clearly formed and ready to be hatched. These shells have been kept in the conservatories of the Queen's House, Barbadoes, for years, and their eggs have been collected.

I have asked our kind friend, the Bishop of Barbadoes, to endeavour to collect some and send them over alive, when, should they come safely to hand, I hope on some future occasion to submit them to the Society.

Captain M'Dakin, in speaking of some phenomena connected with freezing, described a peculiar action witnessed by him a few years ago on the Dane John wall, and referred to the subject of their last meeting, connected with glacial action arising from the accumulated snows of many centuries of winters to which the gravel drifts, boulders, and glaciated rocks bear witness the effect of the property that ice possesses of comporting itself under pressure in a somewhat similar manner to a plastic material. Nor is this entirely confined to ice, for the metals when brought under the coining press are made to assume the forms of the dies, the solid particles sliding over each other. In a similar manner are formed metal articles in domestic use, such as meat covers spoons, and bowls. In the bullet-making machines at the Royal Arsenal the lead is forced from a press through an aperture in a steel plate, about half-an-inch in size, from whence it issues in a long bar many yards in length, which is caught and coiled round a drum. From this coil the bullets are pressed cold. So, also, is made the leaden piping, technically called "compo piping" used for gas, also the leaden pipe lined with tin for conveying water. The metal in a solid form being driven out through a steel die in which is placed a mandril of the size of the bore required. In conformity to the same action of matter ice may, by considerable pressure, be made to issue from a small orifice in a long bar. Water, in cooling down from, say, sixty to thirty-two, contracts in volume till it reaches a little below forty degrees, when the reverse takes place, so that on becoming solid it occupies a greater space than the original liquid, and with a force sufficient to rend rocks, stones, iron pipes, and even gun barrels, but in a very thick and strong steel cylinder, water may be exposed to a temperature below freezing without becoming solid. The experiment was performed in this manner. A strong steel cylinder, with a tightly fitting screw plug, and containing a loose piece of metal was prepared; this being filled with water, was placed in a freezing mixture, but the steel being sufficiently strong to resist the expansion of the water it never became solid, as was made evident by the sound of the loose piece of metal striking the ends of the cylinder as it was turned over. The expansion, however, is far more than any ordinary vessel can withstand, and must be very great, being sufficient in a strong vessel with a narrow opening, to cause a thread or bar of ice to flow out, producing in this manner the curious effect witnessed on the Dane John wall, where the porous bricks forming the coping, were, one frosty morning after rain, seen to be bristling with spines of ice, in some cases beautifully striated and

curved, some of them carrying on their summits small particles or caps of brick.

Another phenomenon occasionally witnessed is "ground ice," formed on pebbles at the bottom of clear ponds or streams, and also on metal gratings, or the mouths of pipes drawing a supply of water through them; in this case the ice sometimes forms a prolongation of the pipe in a direction contrary to the stream. This is puzzling, as we have seen that water on falling below thirty-nine decimal two degrees, ceases to become heavier, and the ice is consequently formed on the surface, but (as suggested by Captain M'Dakin, in an article in the "Proceedings of the Geological Society for 1878,") we have more than one cause operating to bring about these results. As water may be raised above the boiling point in the smooth-surfaced vessel before ebullition takes place, so may water be made to sink to eight or ten degrees below the freezing point before consolidation ensues. Again in the case of certain supersaturated solutions of salts, crystallization does not set in till a solid substance presents itself, and particularly if it be a crystal of the salt in solution when it suddenly commences, and is propagated throughout the whole bulk of liquid. This was demonstrated by solutions of two different salts, the one superimposed on the other, which, by introducing fragments of a similar kind, crystallized at once, the latent heat of the liquid, set free on consolidation taking place, becoming very apparant. It is on account of the heat so set free that a rise of temperature is so generally expected after a fall of snow.

On a clear frosty night the grass, bushes, and boughs of trees radiate their heat, becoming colder than the surrounding air, so that the particles of moisture in the atmosphere are frozen on coming in contact with them, and the feathers of frost are always formed to windward, and sometimes two inches in length. In these we have, then, cases analagous to the formation of ground ice. The stones by radiating their heat become colder than the surrounding water, and being solid substances, the crystallization of the water takes place on coming in contact with them, and, like the hoar frost, in a direction contrary to the current.

The cause of the form of the beautiful frost leaves on the window panes is not easy to describe; but in nature, go as far as we may, there always remains something to wonder at and admire. We can remember our child-like delight when on some bright winter's morning we saw the frost-forms on the glass, and perhaps thought that fairies in the night had traced them there upon the panes; and it is a high instinct of the soul that attributes all that is lovely and beautiful in nature to a spiritual cause, and higher still to the Divine Hand that has given reason and free will to man, instinct to the animals, life and a feeble power to seek the light to the vegetable kingdom, and to the mineral kingdom that molecular force

which sometimes makes itself apparent in chemical affinity, or in producing those admirable crystalline forms, which are only less lovely than the higher developments of beauty in vegetable life.

Mr. Sibert Saunders sent a Sun-star (Solaster papposa) with thirteen rays, and having another animal of six rays, growing as an excrescence from the upper surface of its body; the two animals being thus placed back to back. The dimensions of the Solaster from tip to tip of its rays is five inches, while that of the abnormal animal is three inches from tip to tip. The six rays are uniform in shape and size, and each is furnished with its proper rows of suckers and spines, and is in all respects like those of the parent animal, but, instead of the large central space occupied by the mouth in the perfect animal, the rows of spines converge together, leaving only a small orifice. This curious freak of nature excited much interest. The company expressed regret that Mr. Sibert Saunders was not present to describe it in his usually lucid and pleasant manner, and were exceedingly sorry that Mr. G. Gulliver, F.R.S., was, through continued illness, prevented from entering into the anatomical peculiarities of the creature.

Mr. Fullagar exhibited some large diagrams of four Rotifers, namely, Melicerta Ringens, Tubicolaria Najas, Limnias Ceratophylli, and Lymnias Annulata. All the Rotifers are very beautiful microscopical objects. The three first-mentioned are to be found in ponds in the neighbourhood of Canterbury at certain times of the year; the last named has not been found here, and is new to the East Kent Natural History Society. Mr. Fullagar is indebted to Mr. Muller, of Eastbourne, for the specimens that he has had the pleasure of examining. That gentleman kindly sent him a small bottle of water containing the weed Utricularia, from a pond at Eastbourne, on which the Limnia Annulata was living, and the first small piece of the weed taken from the bottle had two very fine specimens of the limnea on it, which soon put forth the beautiful ciliated lobes forming two wheels, revolving in the most perfect manner. The case or sheath is gracefully formed, small at its attachment to the point of support, and gradually increasing in size to the opening at the top, and though encircled with rings through the whole length, it is sufficiently transparent to enable observers to obtain a satisfactory view of its contents. The long slender body of the Rotifer is seen attached by its tapering foot to the base of the sheath; between it and the sheath wall were three eggs which had passed out of the body and were lying between the body and the sheath wall. The lowest of the three had so far advanced towards maturity that the jaws of the young creature could be distinctly seen in operation, and the cilia formed at the head and two bright red eyes were distinctly visible. In about six hours the lower young limnea was seen to pass up by the other two eggs, and make its exit out at the top of the sheath, and commence a life of independence, by first swimming rapidly about for some time, and then settling down. The cilia

then at the head appears to form one ring or wheel, which, in course of time, is divided into two, and the sheath or case is gradually formed of beautiful transparent rings (hence its name Annulatia). How these uniformly and evenly arranged rings are formed I believe has not been made out. The beautiful sheath or case of the Melecerta Ringens, which is built up by the creature pellet by pellet, we are all well acquainted with, having seen the machine by which they are formed, and witnessed the wonderful little architect repeatedly make and lay the pellets on the wall of its growing case. The formation of each pellet occupies about two minutes and a half. But the formation of the ringed cases of Limnas Annulata baffles us. All the above mentioned Rotifers are very similar in the manner of their reproduction. The egg is formed in the upper portion of the body, and is then passed out through the ovaduct into the sheath, and is there perfected, when it passes up and escapes at the top of the case.

EAST KENT NATURAL HISTORY SOCIETY.

MEETINGS 1879-80.

SCIENTIFIC on WEDNESDAYS, at 7 o'clock.

March	5, 1879
April	2, ,,
May	7, ,,
June	4, ,,
July	2, ,,
August	6, ,,
September	3, ,,
October	1, ,,
November	5, ,,
December	3, ,,
January	7, 1880
February	4, ,,
March	3, ,,
April	7, ,,

N.B.—The Committee meet on the Saturday next following the date of the Scientific Meeting in each month.

ANNUAL MEETING,

TUESDAY, JANUARY 27, 1880, at 4 o'clock p.m.

TWENTY-SECOND REPORT

(1879)

OF THE

EAST KENT NATURAL HISTORY SOCIETY,

ADOPTED AT THE

ANNUAL MEETING,

Held at Canterbury, on January 27th, 1880.

CANTERBURY :

PRINTED AT THE "KENTISH GAZETTE" OFFICE, HIGH STREET.

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CONTENTS.

EAST KENT NATURAL HISTORY SOCIETY.

REPORT OF THE COMMITTEE FOR 1879.

The weather during the past year was not favourable to excursions in the country or to the coast in search of botanical or zoological specimens, and in consequence no general excursions were undertaken, with the exception of one to Whitstable in November, at the invitation of Mr. Sibert Saunders, in connection with the Whitstable Institute, which was well attended and proved a great success. Several objects of interest obtained on the "Street" at low water, and by dredging off the coast, were exhibited and explained by the members present. But though out-door excursions were rare, in-door work was by no means wanting, as the various interesting and instructive papers, which will be printed *in extenso* with this Report, will testify. And here your Committee would wish especially to record their thanks to Captain McDakin for his valuable papers on the Geology of East Kent, read at the successive monthly meetings of the Society in Canterbury; also to Mr. Sibert Saunders, to the Hon. Secretary, G. Gulliver, Esq., F.R.S., to Mr. Fullagar, and to G. S. Saunders, Esq., for their respective communications on subjects connected with Natural History. It is papers of the kind here referred to, illustrated as they usually are by specimens under powerful microscopes, that tend to keep up the interest of the Members and draw others to the Society. During the past year five new members have been elected, and

one only has resigned, thus making 90 members in all on the books at the present time.

As regards funds, the Committee are thankful to be able to state that the subscriptions of 1879, have, with few exceptions, been paid up. They amount to £30 16s., to which must be added £5 5s. 6d., arrears of previous years received in 1879 and up to 10th January, 1880, making a total for the year of £36 1s. 6d., without taking into account the balance remaining to the credit of the Society on the 1st January, 1879, viz., £5 14s. 7d. The actual expenditure slightly exceeded the above amount, thereby reducing the balance in hand at the close of the year to £5 3s. 2d. The grant to the Library, included in the expenditure as above shewn, amounted to £10 19s. 1d., the particulars of which will be found in the Report of the Hon. Librarian. There is still a sum of £16 5s. due to the Society, supposing all arrears to be paid up, but this the Committee scarcely expect will be the case. They do not reckon upon more than £5 5s. Hence it is very evident that there is great need for economy.

The Committee have the pleasure to report that at the meeting of the Society in May last, a letter was read from the Secretary of the Royal Microscopical Society, dated 15th April, 1879, notifying that the President of the East Kent Natural History Society, for the time being, had been elected an ex-offic io Fellow of the Royal Microscopical Society, and was entitled to the privileges of an ex-officio fellow, one of which is to receive a copy of the Society's Journal of proceedings gratis. As a further mark of attention the President of the above Society, Dr. Lionel Beale, has generously presented to the Society's Library a copy of his very valuable work entitled, "How to Work with the Microscope," for which the best thanks of the Committee were returned to him.

In conclusion, your Committee feel that the cordial thanks of the Society are due to its Officers; to the President; to G. Gulliver, Esq., F.R.S., Hon. Secretary, who though unable from illness to attend the meetings in person, nevertheless renders valuable assistance in many ways; also to the Hon. Assistant Secretary, Mr. J. Fullagar, and to the Hon. Treasurer and Librarian, not forgetting G. Rigden, Esq., for his kindness in auditing the accounts.

REPORT OF THE LIBRARIAN FOR 1880.

The grant to the Librarian from the general funds of the Society during the year under review has amounted in all to £10 19s. 6d. Of this sum £2 18s. 5d. were expended in the purchase of new books, a list of which is given below, and £5 14s. 11d. for periodicals, inclusive of the Quarterly Journal of the Geological Society for 1877 and 1878. A further sum of £2 4s. 9d. was paid for binding 15 vols. of previous year's periodicals, and in the purchase of missing Nos. to complete the several volumes before binding, and 1s. 5d. for carriage and postage. The low state of the Society's funds did not permit of a larger sum being spent in the purchase of new books. Those purchased were as follows, viz. :—

1. Mayer's Geography of Plants, Ray Society, 1 vol., 8vo., 1846.
2. Reports and Papers on Botany Ray Society, 1 vol., 8vo., 1846.
3. Two Pamphlets by R. Brown, F.R.S.
   a. Pollen of Plants, 8vo., 1828.
   b. Organs of Orchidacæ, &c., 8vo., 1831.
4. Anatomy of the Blow Fly, by Lowne, B.T., M.R.C.S., 1 vol., Royal 8vo., 1876.
5. Lyell's Elements of Geology, 1 vol., Royal 8vo., 1865.
6. Notes by a Naturalist, 1 vol., Royal 8vo., 1879.
7. Lubbock, Sir John's Lectures, 1 vol., Royal 8vo., 1879.

The following work has been received from the Ray Society in return for the annual subscription of one guinea, viz. :—

Monograph of the British Aphides, by G. B. Buckton, vol. 2, 8vo., 1879.

The Society acknowledges with thanks the under mentioned books and pamphlets, &c., received during 1879, viz :—"How to Work with the Microscope," 1 vol., Royal 8vo., 1880, presented by the author, Dr. Lionel Beale, President Royal Microscopical Society. "Nature," 1879, by G. Rigden, Esq., M.R.C.S. The journal of the Royal Microscopical Society, 1879.

Pamphlets in French, by Mr. Sibert Saunders, viz. :—

Report of the Anniversary Meeting of the Linnean Society of Bordeaux, for 1876. Account of the Artificial Cultivation of Oysters at Arcachon in 1876.
Pamphlets from the University of Christiania,

FINANCIAL STATEMENT, 1879.

RECEIPTS.

	£	s.	d.
Balance January, 1879	5	14	7
Subscriptions for 1879, received up to 10th January 1880	30	16	0
Arrears for previous years paid in 1879, and up to 10th January, 1880	5	5	6
	£41	16	1

EXPENDITURE.

	£	s.	d.
Rent of Room, No. 6, High Street, for one year...	15	0	0
Fire Insurance on Library and Instrument	0	6	9
Subscription to Ray Society	1	1	0
Contribution to Library..................................	10	19	6
Hon. Assistant Secretary, Petty Cash	1	0	0
Do. for Black Board	0	6	0
Do. for Book Shelf, &c................	1	10	4
Ward, for Printing Report for 1878	6	0	0
Gibbs, for 200 Circulars..................................	0	6	0
Carriage and Postage......................................	0	3	4
Balance on the 19th January, 1880.......................	5	3	2
	£41	16	1

W. H. HORSLEY, Colonel,
Hon. Treasurer.

Examined and found correct, January 22nd, 1880.
GEORGE RIGDEN,

Canterbury,
January, 1880.

LIST OF BOOKS AND PERIODICALS.

BELONGING TO THE EAST KENT NATURAL HISTORY SOCIETY.

VERTEBRATA.

Bell's British Quadrupeds, 1 vol., 8vo.
Cassell's Book of Birds, 1 vol., 4to.
Couch's Fishes, 4 vols, 8vo., 1862-66.
Flower's, H. W., Recent Memoirs on the Cetacea, 1 vol., folio, 1866. Ray Society.
Munro's Structure of Fishes, 1 vol., folio, 1785
Nitsch's Pterylography, 1 vol., 4to., 1867. Ray Society
Parker's Structure, &c., of the Shoulder Girdle and Strenum in the Vertebrata, 1 vol, 4to., 1868. Ray Society
Swainson's Birds, 2 vols., 12mo.

PAMPHLETS.

Gulliver, G., F.R.S., on the Red Corpuscles of the Blood of Moschus, Tragulus and Orycteropus
Ditto, Memoirs on the Blood of Lamna Cornubica
Ditto, On Blood Corpuscles of the Hippopotamus, Eared Teal and Walrus.
Ditto, On the Muscular Sheath of the Œsophagus of the "Aye, Aye," (Chiromys Madagascariensis)
Ditto, On the Fibres of the Crystalline Lens of the Petromyzonini.
Ditto, On the Æsophagus of the Red Hornbill.
Ditto, On the Œsophagus of Sauropsida and other Vertebrata
Ditto, On the Size of the Red Corpuscles of the Blood of the Salamander, &c.
Ditto, On the Measurement of the Red Corpuscles of the Blood of Batrachians
Ditto, Sketches of the Spermatozoa of Petromyzon
Hammond, W. H., On the Structure of the Red Blood Corpuscles, &c.

INVERTEBRATA.

Allman's, G. S., M.D., Freshwater Polyzoa, 1 vol., 4to., 1856, bound with Burmeister's Trilobites
Ditto, Monograph Gymnoblastic, or Tubularian Hydroids, parts, 1 & 2, folio, 1871-72, Ray Society
Baird's Entomostraca, 1 vol., 8vo., 1850, Ray Society
Baker's Natural History of the Polype, 1 vol., 8vo., 1743
Bevan on the Honey Bee, edited by Major Munn, 1 vol., 8vo., 1870
Bowerbank's, Dr., Monograph of British Spongiadæ, 3 vols, rl. 8vo., 1864-66-74, Ray Society
Brady's, G. S., Monograph of the Copepoda of British Isles, 1 vol., 1878, Ray Society
Buckton's, G. B., Monograph of the British Aphides, vols. 1 & 2, 8vo., 1876, 1879, Ray Society
Carpenter's Foraminifera, Ray Society, 1 vol., folio, 1862
Curtis on Farm Insects, crown 8vo., 1 vol., 1860
Darwin's Cirripedia, Ray Society, 2 vols., 8vo., 1851-54
Denny's Monographia Anoplurorum Britanniæ, 1 vol., 8vo., 1842
Douglas and Scott's British Hemiptera, Heteroptera, 1 vol., 8vo., 1865, Ray Society

Forbes', Professor E, British Naked Eyed Medusæ, 1 vol., 4to., 1848, Ray Society
Ditto British Star Fishes, 1 vol., 8vo., 1841
Gosse's British Sea Anemones, &c., 1 vol., rl. 8vo., 1860
Greene's The Insect Hunter's Companion, 12 mo., 1863
Hanley's Larmarck's Shells, 1 vol., 8vo.
Huxley's Oceanic Hydrozoa, 1859, 1 vol., crown folio, Ray Society
Johnstone's British Zoophytes, 2 vols., 8vo., 1847
Kirby's British Bees, 2 vols., 8vo., 1802
Kirby and Spence's Introduction to Entomology, 4 vols., 8vo., 1828-29
Lowne's, B. T., M.R.C.S., Anatomy of Blow Fly, 1 vol., 8vo., 187
Lubbock's, Sir John, Collembola and Thysanura, 1 vol., 8vo., 1873. Ray Society
Martyn's, T., English Entomologist, 1 vol., 4to., 1792
McIntosh's, W. C., M.D., British Annelids, part 1, 1873, crown folio, Ray Society
Ditto ditto, part 1 continued, 1874 Ray Society
Morris's British Butterflies, 1 vol., crown 8vo., 1864
Newman's Butterflies and Moths, 1 vol., crown 8vo., 1874
Pritchard's History of Infusoria, 1 vol., rl. 8vo., 1861
Reeve's British Land and Fresh Water Molluscs, 1 vol., 8vo., 1863
Smith's Diatomaceæ, 2 vols., rl. 8vo., 1853
Staveley's British Insects, 1871, demy 8vo.
Turton's, Dr. W., Land and Fresh Water Shells, 1 vol., 8vo.
Westwood's Butterflies of Great Britian, crown 1 vol., 4to., 1855
Ditto Modern Classification of Insects, 2 vols., 8vo., 1839-40
Westwood and Humphrey's British Butterflies, &c., 1 vol., 4to., 1841
Williamson's Recent Foraminifera, 1 vol,. 4to., 1858 Ray Society
Wood's Common Shells of the Sea Shore, 1 vol., 12mo., 1865

PAMPHLETS.

Bates' Phasmidæ
Broeck, A., Crustacea Amphipoda Borealia et Arctica
Fullagar, J. G., On the Development of Hydra
Gulliver's, G., F.R.S., Sketches to Scale of the Auditory Organs of Molluscs
Hammond's, A., Comparison of the Metamorphosis of the Cranefly and the Blowfly
Lubbocks', Sir J., Chlœone
Munn's, Major, Bee Keeper's Magazine, one part
Ditto The Apiary
Oysters, Cultivation of, at Arcachon, 1876
Sars, Michael, Memoirs des Criniodes Vivants
British Moths, Nocturni
,, Geometræ

BOTANY.

Bentham's Hand Book of the British Flora, 2 vols., 8vo , 1865
Berkeley's Cryptogamic Botany, 1 vol., rl. 8vo., 1857
Ditto British Mosses, 1 vol., rl. 8vo., 1863
Ditto Fungology, 1 vol., rl. 8vo., 1860
Brewer's, J. A., Flora of Surrey, 1 vol., 8vo., 1863
Brown's, R., Miscellaneous Botanical Works, 2 vols., 8vo., Ray Society, 1866, and 1 vol. Atlas of Plates, 1868
Clarke's Common Sea Weeds, 1 vol., 12mo.
Cowell's, M. H., Floral Guide to East Kent, 1 vol., 8vo,, 1839 (2 copies)
Darwins, Chas, F.R.S., Forms of Flowers, 1 vol., 8vo., 1877
Ditto Insectiverous Plants, 1 vol., 8vo., 1875
Dillwyn's British Confervæ, 1 vol., 4to., 1809
Evelyn's Silva, 2 vols., 4to., 1786
Gatty's, Mrs., Atlas of British Sea Weeds, from Professor Harvey's Phycologia Britannica, 1 vol., 4to., 1863
Harvey's, Professor, Synopsis of British Sea Weeds, 1 vol., 12mo., 1857

Henfrey's Elementary Botany, 2nd edition, by Dr. Masters, 1 vol., 8vo., 1870
Hooker's Jungermanniæ, 1 vol., 4to., 1816
Jacob's, Faversham Plants, 1 vol., royal 12mo., 1777
Leighton's British Lichen Flora, 1 vol., 8vo., 1872
Lindley's and Moore's Treasury of Botany, 2 vols., 8vo.
London's Encyclopædia of Plants, with 2 supplements, 2 vols., rl. 8vo., 1841-55
Masters' Vegetable Teratology, 8vo., Ray Society
Mayer's Geography of Plants, Ray Society, 1 vol., 8vo., 1846
Pulteney's Progress of Botany in England, 2 vols., 8vo., 1790
Ralf's Desmidiæ, 1 vol., crown 4vo., 1848
Reports and Papers on Botany, Ray Society, 1 vol., 8vo., 1846
Smith's, G. E., East Kent Flora, 1 vol., 8vo., 1829
Ditto, Sir J. E., English Flora, 4 vols., 8vo.
Wilson's Bryologia Britannica, 1 vol.

PAMPHLETS.

Blytt, A., Phanerogamer of Bregner
Brown, R., F.R.S., Organs of Orchidaceæ, 1831
Ditto, Pollen of Plants, 1828
Gulliver, G., F.R.S., Crystals in the Testa of the Elm and the Character of the Epidermis of the Tway-Blade
Ditto, Notes on Lemnaceæ and the Raphidian Character of Plants
Ditto, Sphæraphides in Urticaceæ and Leonurus
Hall and Woodhouse, Misses, Orchidaceæ found near Eastbourne
Miller, C. T., On a New Fungus
Woodhouse, Miss, Adoxa Moschatellina

PERIODICALS.

The Phytologist, vol. 3, 1859

GEOLOGY.

Burmeister's Trilobites, 1 vol., 4to., 1846, bound with Allman's Freshwater Polyzoa, 1856
Conybeare and Phillips' Geology, 10th edition, 1 vol., 8vo., 1822
Lyell's Principles of Geology, 2 vols., rl. 8vo., 1867-68
Ditto, Elements of Geology, 1 vol., rl. 8vo., 1865
Phillip's, Professor, Manual of Geology, 1 vol., 8vo., 1855
Ramsay's Physical Geography of Great Britain, 1 vol., 8vo., 1864
Southall's, J. C., L.L.D., Epoch of the Mammoth, 1 vol., 8vo., 1878
Memoirs of the Geological Survey of Great Britain, 2 Nos.

PAMPHLETS.

Carruthers, On Osmundites Dowkeri from the Eocine of Herne Bay
Dowker, G., On the Chalk of Thanet and East Kent
Owen, On the Skeleton of an extinct Sloth, Mylodon Robustus, 1 vol., 4to., 1842
Portlock's Geological Report on Londonderry, &c, 1 vol., rl. 8vo., 1843
Whitaker's, W., List of Works on the Geology, Mineralogy, and Palæontology of the Hampshire Basin
Ditto, Introductory Lectures School of Mines, 1851-53

PERIODICALS.

The Geological Magazine
The Geologist from 1852
Quarterly Journal of the Geological Society from 1861, vols. 20

MISCELLANEOUS.

Barclay on Life and Organization, 1 vol., 8vo., 1822
Beale, Lionel S., F.R.S., How to Work with the Microscope, 1 vol., rl. 8vo., 1880
Busk's Reports on Zoology, Ray Society, 1 vol., 8vo., 1843, 1844,
Carpenter's Comparative Physiology, 1 vol., rl. 8vo., 1851
Dallas's Animal Kingdom, 1 vol., 8vo.
Davis On Preparing and Mounting Microscopic Objects, 1 vol., 12mo.
Gosse's Evenings at the Microscope, 1 vol., 8vo., 1859
Ditto Marine Zoology, 2 vols., 12mo., 1855-56
Hart's, Rev. H. M., World of the Sea, 1 vol., rl. 8vo., 1869
Haughton's Three Kingdoms of Nature, 1 vol., 8vo.
Hewson's, W,, F.R.S., Works, edited by G. Gulliver, F.R.S., 1 vol., 8vo., 1846
Jones', Rymer, Outlines of Animal Kingdom, 1 vol., 8vo., 1861
Knapp's Journal of a Naturalist, 1 vol., 8vo., 1830
Leach's Zoological Miscellany, 1 vol., 8vo., 1814
Lubbock's, Sir John, Bart., F.R.S., Scientific Lectures, 1 vol., rl. 8vo., 1879
Moseley's, H. N., F.R.S., Notes by a Naturalist, on H.M.S. Challenger, 1 vol., rl. 8vo., 1879
Newport's, G. Miscellaneous Works, 1 vol., 4to.
Owen's Comparative Anatomy, 3 vols. rl. 8vo., 1866
Pulteney's Life and Writings of Linnæus, 1 vol., 4to., 1805
Quekett's Lectures on Histology, &c., 2 vols., 8vo., 1852-54
Rusticus's Natural History of Godalming, 1 vol., 8vo., 1849
Siebold on Parthenogenesis, 1 vol., 8vo., 1857
Swan's Nervous System, 1 vol., 4to., 1864
Thompson's Wyville, Depths of the Sea, 1 vol., 8vo., 1873
Ditto Second Voyage of the Challenger, 2 vols., 8vo., 1876
Wallace's, G., Malay Archipelago, 2 vols., 8vo.
Wallace's, G., Distribution of Animals, 2 vols., rl. 8vo., 1876
Wells' Essays by and a Memoir of his Life, 1 vol., 8vo., 1818
White's Gilbert, Natural History of Selborne, 1 vol., 8vo, 1875
Micrographic Dictionary, 1 vol., with vol. of plates

PAMPHLETS.

Guldberg et Waage's Etudes sur les Affinités Chimiques
Gulliver, G., F.R.S., Review of Works by Goodsir and others
Kingsford, T., Reminiscences of Animals, Birds, Fishes, and Meteorology, 1 vol., 8vo.
Newport, G., F.R.S., Ten Papers by, 1 vol., 4to
Reade, Rev. J. B., F.R.S., The Diatom Prism, &c
Saxe, S. A., Le Glacier de Boinon
Wallich, Dr,, Seven papers by
Ditto, Eight papers by
Ten papers from the Royal University of Christiania
Seven papers ditto ditto ditto

PERIODICALS.

Annals and Magazine of Natural History
Journal of the Royal Microscopical Society, 1879
Land and Water, 9 vols., 1866-70
Magazine of Natural History, from 1859, except vol. for 1862
Monthly Journal of the Royal Microscopical Society
Natural History Review, vol. 3, 1863, and vol. 4, 1864
Natural History Repertory, 1865
Nature, 6 vols., 1875 to 1879, 4to
Quarterly Journal of Microscopical Science, from 1859, except vol. for 1862
Quarterly Journal of Science to 1869

Science Gossip, 1870 to 1876, 4to., 7 vols.
Zoologist from 1843 (vol. for 1862 incomplete)

REPORTS.

Cardiff Naturalists' Society Report and Transactions
Croydon Microscopical Club, 6 Reports
Eastbourne Natural History Society, 1871-72, 1874-5, 1875-6
Folkestone Natural History Society, 1871
Ditto Microscopical Club, 1871
Linnean Society of Bordeaux, 1876
Quekett Microscopical Club, June, 1874
Wellington College Natural Science 1872-3, 1873-4, 1874-5
West Kent Natural History Society 1871-2
Ditto West Kent Microscopical and Photographic Society
Zoological Society's Report of Council, 1877

PERIODICALS TAKEN IN BY THE SOCIETY.

Annals and Magazine of Natural History
Geological Magazine
Publications of the Ray Society
Quarterly Journal of the Geological Society
Quarterly Journal of Microscopical Science
Science Gossip
The Zoologist

The Librarian requests that Members taking Books or Periodicals from the Library will be careful to enter the same in the book kept on the table for the purpose, with the dates, "when borrowed" and "when returned."

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Payne-Smith, Miss J.	Ditto
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Wright, J. W. Z., Esq.	Barton Fields, Canterbury
Wright, Dr. J. Hornsby	3, St. George's Fields

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Prebble, Mr. J. G.	Ramsgate
Pugh, Mr.	Canterbury
Young, Mr.	Sittingbourne

EAST KENT NATURAL HISTORY SOCIETY.

TITLE & OBJECTS OF THE SOCIETY.

The objects of the EAST KENT NATURAL HISTORY SOCIETY shall be the Collection and Diffusion of Practical and Theoretical Knowledge respecting Natural History, in all its Branches, both in relation to the particular District and the General Science.

RULES AND REGULATIONS.

MEMBERSHIP.

1. The Society shall consist of Ordinary, Honorary, and Corresponding Members, and of Associates.

2. Every candidate for admission into the Society as an Ordinary Member must be proposed in writing by two Members, and the election shall be by show of hands or by Ballot, taken at any Meeting of the Committee, or at a general Meeting—one negative in five votes to exclude.

3. The annual Subscription to be paid by Ordinary Members shall be Ten Shillings; the Subscription shall become due on the 1st of January in each year, and shall be paid in advance for the current year. Any Member neglecting to pay his Subscription for three months after it is due, shall be applied to by the Treasurer or Secretary, and if the Subscription remain unpaid for three months after such application, he shall cease to be a member of the Society.

4. The Committee shall have power to admit, without ballot, on the nomination of two Members, any Lady who shall be desirous of becoming an Ordinary Member, and her Subscription shall be Five Shillings. This rule shall apply also to such sons, brothers, and nephews of Ordinary

Members, as may be regularly resident in the same house with those Members.

5. Any person distinguished for their researches in Natural History, for their liberality to the Society, or for their connection with similar Societies, may on the recommendation of the Committee, be elected Honorary or Corresponding Members of the Society, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subject to any of the expenses of the Society, and shall have no vote in its affairs, nor be entitled to take books out of the Library, or to the Reports and Notices.

6. In order to cultivate the study of Natural History, among individuals of the class of Mechanics, &c., residing in the district, the Committee shall have power to admit individuals of that class as Associates, provided they shall first communicate some information or observation on Natural History, exhibit such specimens or present them to the Local Museums, as shall by their merits satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

MANAGEMENT AND BUSINESS MEETINGS.

7. The affairs of the Society shall be conducted by a Committee of Management, which shall consist of a President, Vice-Presidents, a Treasurer, and an Honorary Secretary, with not less than six Members, who shall all be chosen at the Annual Meeting. Three Members of such Committee shall form a quorum. The Meetings shall be held at four o'clock p.m. on the 1st Saturday in every month, and at such other times as the Secretary may deem necessary. At any regular meeting including a sufficient number of Committee-Members, they may then and there declare themselves and act as a Committee in the ordinary business of the Society.

8. An Annual Meeting shall be held at four o'clock p.m., on the last Tuesday in January, in each year, at Canterbury, for the purpose of electing the officers for the current year, receiving the Annual Statement of Accounts, and Report of the Committee, and conducting the general affairs of the Society. In case of necessity, the Committee may alter the hour, posting due notice thereof in the Society's room.

9. Special General Meetings may be summoned by the Committee, or by the Secretary, on the requisition (in writing) of any six Members of the Society, the specific purpose of the Meeting being stated in the notice, which shall be sent to each Member not less than one week before the time of such Meeting.

10. All questions discussed at the Meetings shall be decided by a majority of votes; and if upon any question the votes shall be equal, the Chairman of the Meeting shall have the second or casting vote.

11. In the event of any vacancy occurring in the Officers or Committee between the Annual Meetings, the same shall be filled up by the Committee. The two Members who have been longest thereon, and have attended the fewest meetings thereof, during the preceding year, shall go out by rotation at the Annual Meeting.

12. In order to facilitate the objects of the Society, the Committee shall be empowered to appoint any Member a Local Secretary for the town or district he may reside in. Such Local Secretary shall be *ex-officio* a Member of the Committee.

SCIENTIFIC MEETINGS AND EXCURSIONS.

13. The Meetings of Scientific Business shall be at Seven o'clock p.m. on the first Wednesday of every month, at Canterbury; also extra Meetings at such place and time as the Committee shall have posted due notice of in the Society's apartment. Each Member to have the right of introducing a Visitor at these Meetings.

14. There shall be ordinary Excursions on the Afternoon of the day of each evening Scientific Meeting, and at other times, if the Committee so appoint, time and place to be duly notified in the Society's room by the Committee; and Special Excursions at such times and places as may be approved by the Committee, who shall consider written suggestions of Members on the subject.

15. Minutes of the proceedings of all Meetings shall be entered by the Secretary in a book kept for that purpose.

16. The Secretary to give seven days' notice of Special Excursions to every Member, stating the time and place thereof, &c.

LOCAL OR DISTRICT MEETINGS.

17. To promote still further the objects and interets of the Society Local Secretaries and Members are invited to organize Meetings or Excursions in their district, and to give notice of the same to the General and all the Local Secretaries, stating the time and place of Meeting, and what particular subjects are to be brought forward.

COLLECTION OF SPECIMENS.

18. The Society, as soon as it may possess sufficient means, shall

endeavour to make a Collection of Objects of Natural History, both with a view of forming a Museum and distribution of Duplicate Specimens according to the Regulations to be adopted by the Committee.

LIBRARY.

19. Only Books and Periodicals connected with Natural History are to be purchased by the funds of the Society, and the number and particular books of this class to be purchased shall be determined by the Committee.

20. All the Books and Periodicals shall be kept in some convenient place, so that Members shall be able to refer to them or take them out under such regulations as the Committee from time to time may think proper to make.

21. Members are also invited to lend Books for the use of the Library, reserving to themselves the full right of ownership; such Books to be under the care of the Committee, and not allowed to be taken out of the Library.

22. In order to allow the Librarian to examine the Books they must all be returned to the Library and none taken therefrom during the first week in every June.

ABSTRACT OF MONTHLY SCIENTIFIC MEETINGS.

FEBRUARY.

Letter from Mr. G. S. Saunders on the relation between Plants and Insects.

Colonel Horsley read the following letter :—

St. Stephen's Lodge, Canterbury,
23rd January, 1879.

Dear Sir,—Some of the members of the East Kent Natural History Society, who heard Sir John Lubbock's very interesting lecture, in this city, on the relation between plants and insects, in which he mentioned that Bumble Bees are the only insects which assist in the fertilization of the Antirrhinum, on account of the peculiar formation of the flowers, may be interested in the following notes, made last autumn, on this insect, by myself. One morning in September last I noticed a large female Bumble Bee collecting nectar from the flowers of an Antirrhinum, growing at one end of a long border containing several Antirrhinums, and a dozen or more different kinds of plants in full bloom. Having visited all the flowers on that plant, she flew to the next Antirrhinum and so on all down the border, paying no attention to the other flowers, and not missing a single plant of Antirrhinum, as if she knew she had a better chance of obtaining nectar from them than from the other plants. When she settled on a flower she alighted on the lower lip, to which she clung tightly, her weight causing it to fall sufficiently for her to thrust her head in far enough to enable her to reach the nectar with her proboscis. Occasionally she flew about a flower without attempting to open it, from which I think we may conclude she had some means of knowing that these flowers were not worth visiting. Once or twice having withdrawn from a flower she buzzed about and re-entered it. I gathered some of the flowers to ascertain what force was required to open them, and found that on an average a weight of 20 grains would cause the flower to open a quarter of an inch. They, however, varied considerably, some opening with 3 grains, and others requiring 34 grains; the older flowers opened easiest. I experimented on

nine blossoms by using a S shaped hook of fine wire hooked into the extreme edge of the under lip, on which I hung small pieces of bent wire, until the lip fell a quarter of an inch. I then weighed the hook and wires. Smaller insects do, at times, obtain the nectar by making a hole through the base of the blossom. I may mention, in connection with some of Sir John Lubbock's remarks on the colouration of insects being generally a safeguard to them, that at Clifton, near Bristol, I noticed a humming bird moth flying about a bed of flowers, at the back of which was a high limestone wall. Presently the insect left the flowers and began hovering about the face of the wall, as if searching for something. At last it settled, but was on the wing again immediately. Hovering about as before it again settled, and had I not noticed where it rested I should have been unable to detect it, so exactly did it resemble in colour the shades and markings of the stone, and I tried in vain to make a friend see the insect. It remained in this position for upwards of an hour; in its first position it was easily seen. I cannot doubt that the moth when flying about the wall was searching for a suitable resting place, and that it was aware that it was safer in the position it eventually chose than in the first one. I noticed in Colonel Horsley's garden, in Canterbury, much the same stratagem used by a moth, which settled on a withered leaf of the common bindweed, and was practically invisible.

I remain, yours truly,

George S. Saunders.

On the Intermitting Streams of the District, by Mr. W. H. Hammond.

Nailbourne is the name given to several intermittent streams which have their origin in the chalk hills of Kent. There are two in this district, one rising at Elham and running through Barham and Bridge, and one at Petham. It is the last with which I am more particularly concerned. The name Nailbourne is variously spelt, Nail, Nale, and Nayle, but I think the most correct way is Nail, from the fact that these streams were formerly supposed to have great healing powers; hence the name an "ail" bourne, or they were called "ail" bournes, because when they ran a bad year for farmers was always expected, and to this day the same bad times are looked out for whenever the Nailbourne shows signs of breaking out. The Petham Nailbourne is chiefly fed from a number of springs which rise in a pond close to the village, but on some occasions, after a very rainy time, the springs break out at Duck Pit Farm, about a mile further up the village towards Elmsted, and on very rare occasions at Dean Farm, two or three miles further up the same

valley. It follows the course of the Petham Valley, and used to empty into a stream at Shalmesford Street, which ran into the river Stour, but of late years it has been turned into a small pond at Perry Farm, where the earth is sufficiently porous to let it drain away. The Nailbourne does not run at regular intervals nor for any regular time, but it generally begins about January, after a wet autumn and winter, and runs till about the middle or end of summer. In 1860 it ran all the summer, which was very wet, and on through the winter and spring, but until recently it was not known to have run for more than two years in succession. The hill from which the Nailbourne takes its rise lies to the south and south east of the village, and is a spur of the great chalk range which runs through Kent. The pond at Petham is about 180 feet and the top of the hill about 450 feet above the sea level. The old theory of the origin of the Nailbourne was that in this hill there existed a great cavity; that after heavy rains this cavity became filled with water, which ran out by a subterranean passage; when the stream had once started this passage was supposed to act the part of a syphon till the cavity was empty. I do not place any faith in the old theory, but I think that after heavy rains the water soaks down through the soil and porous upper chalk till it meets with a much closer and harder layer of chalk, through which water can pass but very slowly. The chalk above this then gets supersaturated and the water meeting with cracks and fissures, which act the part of drains, follows them till they come to the surface of the hill sides. It takes a long time for all the water to soak down through the hills to this water-logged layer of chalk, and the stream keeps running till all the water has drained down. In the report about the Canterbury Water Works, the engineer states that it probably takes a century for the rain which falls on the hills about Canterbury to reach the water-bearing stratum which supplies the well, but I cannot believe that it takes quite so long. After heavy rains and before the Nailbourne breaks out, the water in all the wells in the Petham Valley rises considerably, and people who live in the village can tell by the length of rope they have to let out to reach the water when the springs will rise in the pond. The rainfall before the Nailbourne last ran was—in October 2.370 inches, November 6.130 inches, December 2.848, January 1.485 inches—total 12.833 inches; and for the past season—October 3.510 inches, November 5.990 inches, December 2.685 inches, January 3.060 inches —total 15.155. Rather more than for the preceding season, so it seems likely the Nailbourne will run about as strong as it did last time, if the spring rainfall should be about the same. The above rainfall was taken at Milton Chapel, probably the rainfall at Petham is rather higher, for in 1877 the rainfall at Milton,

about 50 feet above the sea level, was 32.96 inches, while at Acrise, 484 feet above the sea, it was 47.31 inches. Again, in 1878, at Milton, the rainfall was 29.845, and at Acrise 40.68 inches. The rainfall at Milton Chapel and at Canterbury was almost exactly alike for both 1877 and 1878.

I will now mention a few points concerning the analyses of a few samples of water in this chalk district to show how closely they resemble one another, and also how the amounts of the different substances held in solution may vary when the waters become defiled from any cause.

1. Canterbury Water Works water straight from the well:—Total solids, 23,92 grains per gallon, containing 15,96 grains of chalk, 1,34 grains of nitric acid, and 1,47 chlorine; free ammonia, 01 parts per million, or one part in 100 millions; albuminoid ammonia, .016 parts per million or about 1½ in 100 millions; nitrites, absent.

2. Naylebourne water taken at a strong spring:—Total solids, 22 grains per gallon, containing 14,42 grains chalk, 1.25 grains nitric acid, and 1,24 grains chlorine; free ammonia, .01 parts per million; albuminoid ammonia, .03 per million; nitrites, absent.

3. From a well in the meadow, about a mile from Petham, and away from houses:—Total solids, 21.35 grains per gallon; chlorine, 1.24; free ammonia, .04 parts per million; albuminoid ammonia, .07 parts per million; nitrites, absent.

All those waters are very pure; it will be noticed how closely they resemble one another.

4. From a well close to a farm house at Petham:—Total solids, 29.4 grains per gallon; chlorine, 1.74 grains: free ammonia, .04 parts per million; albuminoid ammonia, .08 parts per million; traces of nitrites.

The presence of the farm yard, it will be noticed, has raised all the items, but still it may be classed as a wholesome water.

5. From a well in the middle of the village:—Total solids, 22.4; chlorine, 1 57; free ammonia, .05; albuminoid ammonia, .17.

Here the albuminoid ammonia is much too high; the free ammonia and chlorine are also rather high.

6. Another well at Petham with a pump:—Total solids, 24.5; chlorine, 1.33; free ammonia, .03; albuminoid ammonia, .04.

Also a very good water.

While the Nailbourne is running, from the above analyses it seems that Petham is abundantly supplied with pure water. I expect that the large quantity of water in the soil thoroughly cleanses all the wells. It would be interesting to know the composition of some of the village well waters soon after the heavy rains set in after a long drought.

Now a few words as to what may be learned from a water

analysis. If we take Canterbury Water Works water or the Nailbourne water as samples of our best waters, we must not call all waters which do not come up to this standard unwholesome, for there are many wells about which do not give quite so good an analysis, but are perfectly wholesome. As a general rule, all waters in this district containing much more free ammonia, albuminoid ammonia, and chlorine than our standards may safely be judged to be contaminated with sewage and if the albuminoid figure is very high it shows that the pollution is still going on. A normal quantity of chlorine, with a very high albuminoid ammonia figure, shows that the contamination is vegetable. The albuminoid ammonia is the ammonia which organic matter gives off when treated with suitable agents in the analysis; the quantity multiplied by 10 gives the amount of organic matter. High chlorine, free ammonia and nitric acid figures, together with nitrites, show that the water either has formerly been contaminated with sewage or that there is some source of pollution not far off, but at present the earth is capable of oxidising or rendering harmless the organic matter. It is dangerous to drink this water, for no one can tell how soon the earth may become overcharged with the filth and lose the power of rendering it harmless. This water may possibly be the means of communicating disease from a distance Waters, which at one time give a good analysis, may be quite unfit for drinking at another. In connection with the subject of Nailbournes, I have brought two specimens of stone, which were kindly given me by Mr. Sheppard, who also gave me their history. First, a piece of Travertine used by Archbishop Lanfranc in 1080 to fill up the vaults of the groining of the nave of Canterbury Cathedral, being stronger than chalk to resist compression and much lighter. That nave fell down in 1400. In Herefordshire all the river valleys abound in Tavertine, and nearly all the early churches are built of it. In Kent, it is found at Postling, and in the valley between Ewell and Alkham, and as a general rule at the fountain-head of springs in limestone districts. The specimen originally came from Alkham. Stalagmite was used at the building of the choir of Canterbury Cathedral about 1100 to 1130. It was used by Prior Ernulph and Prior Conrad who succeeded one another. The space round the Communion Table in the Cathedral is paved with it, and some of the outer columns are made of it. When Prior Ernulph was made Bishop of Rochester about 1115, he esteemed this stone so highly that he took two small columns with him, which are still to be seen in the remains of the cloisters in the Dean's garden. He also gave two columns to the Abbot of Saint Augustine's; they are broken up, but are still to be found built into the garden walls.

On some Optical Phenomenon, by Captain McDakin.

One of the most beautiful effects of Nature is that presented at sunset, when not only mountain peaks and cliffs glow in the ruddy light, but the most flat and at other times uninteresting country, puts on the appearance of an immeasurable expanse covered with a luminous and gloriously tinted haze. In foggy smoky grimed London, looking westward from the Marble Arch, sunsets may sometimes be seen of unsurpassed beauty. It seems as if out of the very imperfection of things, smoke and damp and fogs, beauty grew as flowers do out of the unsightly soil. As the rainbow is the token of the covenant of promise, so the sunset has been looked upon as a memorial of the time when God walked with Adam in the cool of the evening. Doubtlessly these things have their moral as well as their physical significance. It would be as unscientific to ignore the one as the other. The question is often asked, what is the cause of the predominance of the red rays at sunset? It is sometimes stated that it is due to the red rays being stronger than the rest, so that they penetrate the clouds when the others, so to speak, are filtered out or absorbed. If this were the case we ought to have the same effects, to a less extent, at mid-day. Or it is ascribed to the polarisation of light, which being a very good sounding term, generally proves sufficient for, if it does not satisfy, the questioner. But is it not rather mainly due to the atmosphere rapidly decreasing in density having the same optical effect as a triangle glass prism, which to reverse the case would bring about similar results of refraction if it were possible to make a rectangular one gradually decreasing in density upwards? The white light being in this manner analysed into its seven primary colours, absorption at the same time taking place depending upon varying conditions of the atmosphere, red, golden, or silver sunsets are produced. The minglings of the red rays with, and their diffusion through the clear blue sky at sunrise, very rarely in this climate produces the beautiful red purple sky, which I witnessed one June morning, about sixteen years ago, at Hythe. A curious and striking optical phenomenon may be seen in Canterbury Cathedral of an afternoon when the gas is lighted in the choir. If a position be taken close to the west end of the south aisle of the choir, and the wood carving of the organ screen be looked at through the glass, filling up the spaces above the stalls, it will appear as if painted a chrome yellow, in some places almost equal to a dead gold surface, with a purple blue fillet in the architrave and silver ornaments, the effect being very conspicuous, bearing a resemblance to Majolica ware, in brilliancy and contrast. The colouring is so distinct that it is almost impossible to believe that it

has not been decorated with colour, until on entering the choir the well-known dark wooden carving is seen. This effect is most probably due to reflected rays of light suffering interference on passing through thin films, caused by age upon the glass, and only waves of light of a certain length reaching the eye the effect of colour is produced. It must not be be confounded with the reflection of the stained glass windows or the beautiful tints they throw on the columns when the sun shines through them. It is so curious that it is remarkable it has not attracted more attention.*—Some diagrams were then shown illustrative of the refraction of light in passing through a medium, gradually decreasing in density, and triangular prisms. Also the interference of waves of light producing colour, on being reflected from, or in transmission and reflection through thin transparent films.

MARCH.

On the Ascidian, by Colonel Horsley.

Colonel Horsley, R.E., exhibited a dwarf specimen of an Ascidian, which has existed in his salt water aquarium for upwards of eighteen months and seems quite reconciled to its confinement. It belongs to the class of Tunicata, which includes the lowest of the Acephalous Mollusca, which are destitute of the power of forming a shell, but which have the outside of the mantle condensed into a tough, leathery, or cartilaginous tunic, from which their name is derived. Many of them live separately, and have the power of freely moving through the water. Others associate together into a compound mass; of which, however, the individuals are not connected by any internal union. But others form really compound structures, each individual being able to live by itself alone; but being connected by a stem and vessels with the rest. The general structure of the individuals is the same, however, in the single and in the composite animals of this class. The cavity of the mantle possesses two orifices; by one of which a current of water is continually entering, whilst by the other it is as continually flowing out. These orifices lead into a large chamber, the lining of which, folded in various ways, constitutes the gills; and at the bottom of this chamber lie the stomach, and the intestinal canal, which terminates near the aperture for the exit of the water. All these parts are covered with cilia, by the action of which a continual stream is made to flow over the gills, and to enter the stomach; and the minute particles, which the water brings with it, and

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* Note.—This phenomenon is no longer observable, as the Cathedral is now lighted by rows of gas jets instead of standards.

which are adapted to serve as food, are retained and digested in the stomach. Even these animals, fixed to one spot during all but the early part of their lives, and presenting but very slight indications of sensibility, possess a regular heart and system of vessels; and these vessels form part of the stem, by which the compound species are connected. — Dr. Carpenter, speaking of the nervous system of these animals, remarks:— "The simplest form of the nervous system in this class is seen in the solitary Tunicata, and Ascidia. Between the orifice by which the water enters and that by which it passes out again, is a single ganglion, which sends filaments to both of them, and other branches which spread over the surface of the mantle. When any substance is drawn in by the current, the entrance of which would be injurious, it excites a general contraction of the mantle, and this causes a jet of water to issue from both orifices, which carries the offending body to a distance, and in the same manner, if the exterior of the body be touched, the mantle suddenly and violently contracts. These are the only actions which, so far as is known, the nervous system of these animals is destined to perform. They do not exhibit the least traces of eyes or other organs of special sense; and the only parts that appear peculiarly sensitive are the small tentacula which guard the orifice by which the water enters. It would seem as if the irritation caused by the contact of any hard substance with these, or with the general surface of the animal, caused an instinctive contraction of the mantle, having for its object to get rid of the source of the irritation. Such a movement could only be performed by the aid of a nervous system, which has the power of receiving impressions and of immediately exciting even the most distant parts of the body to act in accordance with them. In the Sensitive plant and Venus' fly-trap an irritation applied to one part is the occasion of a movement in another; but this takes place slowly, and in a manner very different from the energetic and immediate contraction of the mantle of the Tunicata. The larva of the compound Sessile Ascidians is like the tadpole of a frog, which swims about for a time; it then fixes itself by the head to some object, the tail falls off, and in a few days it becomes a solitary Ascidian, with its two orifices and currents of water. This solitary animal gives origin by budding to a connected group, which in its turn lays fertilized eggs, so that there is an alternation of generations. These Tunicata live on diatoms and morsels of sea weed, and, like all fixed Ascidians, they show no external sign of vitality except that of opening and shutting the two orifices.

On the Stalactic Stones used in the Pavement of Prior Conrad's Choir in Canterbury Cathedral, by Mr. A. Wetherelt.

At our last meeting Mr. Hammond produced some petrifactions from our own Cathedral, which I consider as remarkable as they are beautiful, being evidences of the ever working and never ending processes of nature, of which every stone, or the simple blade of grass, in their structure and building up, are wise and practical sermons.

I place before you some specimens of Stalactites, well polished. When they first came into my possession they were stated to be petrified wood, but upon careful examination that proved to be incorrect, and without doubt they are sections of Stalactites, which I need hardly state are the slow drippings of water, filtering through the various depositions of earthy matter, until they form the most beautiful and graceful pendants in caverns. The other specimens to which I more especially allude are Stalagmites, or more properly, Stalactical Stalagmites, the markings of which are particularly interesting, as showing the different periods of wet and dry seasons. They are so distinct and well defined as almost to form a reading. No question, at some vast distance of time, these specimens formed part of the flooring or bottom of a cavern, and are distinguished by being called Stalagmites. One specimen I wish particularly to call your attention to, which has been carefully prepared for the purposes of this evening. Not only does it show the beautiful markings of, and in, its depths, but it also shows very clearly the markings of the surface, proving the drippings of water, and layer upon layer, as well as the different shadings, as would appear by the dripping of water upon calcareous earth or sand. In the present day petrifactions of this kind go on very rapidly. My specimens are doubly interesting to me as relics of the pavement of the glorious choir of Conrad, so famed in our Cathedral before its destruction by fire in the year 1174. There are several fine slabs near the present Communion Table, where, I trust, they will ever remain; they are from three to four feet long by two wide, showing all the markings I have before mentioned. These are very rarely seen by the public, as they are, very properly, only shown to those who take a special interest therein, and by favour are permitted within the Communion rails. I must here mention that after the destructive fire the altar was carried much farther back than its original position, and some few years ago, upon some repairs to the lower steps in the original pavement beneath, between the stones lead was found from the dis-

astrous fire of 1174. Should any of our members desire to see and examine for themselves, I would suggest that they ask for Mr. Pugh, one of the most observant, indeed intelligent, men in his position of life, I have ever met with either at home or abroad. I must here mention how well the monks and men of old understood the durability of materials, both in wood and stone. Well might they select Stalagmite for their pavement, they knew full well that it would outwear all other kinds of stone. There is a legend that it was brought by some great man of piety, as an atonement, from one of the caverns in Italy, near Naples, and I am almost inclined to believe it, inasmuch as we know in early times such things were often done by way of penance, and are still done, by the Romish Church, in many places abroad, and even now in England. Be this as it may, I have sought specimens of the same kind from all parts of the world, and at very great expense, and can find none. Alabaster from Stalactite is sometimes pure white, but this kind is not so durable as that which is light yellow in colour or veined. The iron, which is the colouring matter, communicates to the stone a degree of hardness, and on this account the coloured alabaster was more prized by the ancients, and mostly selected by sculptors, in preference to the pure white. The substance was very much used by the ancients, and called by them alabaster, and alabastrite; the alabaster used by the moderns is more frequently gypsum, or sulphate of lime. Stalactites form so rapidly, in some caverns and mines, as to close up the entrance, and fill up the excavations with the depositions of calcareous earths, found on the floors of the caverns, by the waters which drop from the roofs. So much for the relics of our dear old Cathedral. In all its materials, its very structure, condition, and grandeur, there is something to dwell upon by every reflecting mind.

We do not trace this Stalagmite paving in the time of Ernulf, previous to Conrad; the paving of Ernulf being of a very different character. I am somewhat surprised that no jeweller in this town has had sufficient enterprise to work up this material into articles of ornament, which could be easily done, and would be much coveted by the pilgrims of various nations, as well as visitors.

I find by a small book published in the year 1783, by the Rev. John Duncombe, M.A., mention is made of certain alterations, at the time the wooden stalls and screens were set up, when the old monkish stalls were cleared away (and which said wooden screens in their turn were also cleared away about forty years ago, and sold for one hundred pounds, being the work of Grinling Gibbons, and stowed away in the crypt to decay), two steps were taken up and placed three or four more feet toward the east, when melted lead was discovered in the joints of the pavement, most probably occasioned by the fire, when the roof of Conrad's glorious choir was destroyed. Eastward, towards the altar rail, was paved with large slabs of

stone, which so much resembles that of wood, as to be by some mistaken for a petrifaction. They receive a most exquisite polish, the edges are very curious and the tops beautifully clouded. Dr. Peacock called them the flowered jasper, and others Egyptian, the Sicilian, and the Antique Alabaster. The large specimen I place before you, all will admit is worth some consideration.

MAY.

On the Development of the Doris Tuberculata, by Mr. Sibert Saunders.

Mr. Saunders exhibited some microscopic marine zoophytes and polyzoa, sertula pumila, Bower baukia, Alcyonidium, gelatinosum, and Bugula avicularis, and gave the following description of the development of Doris tuberculata, the eggs of which species he also exhibited.—The eggs of the Nudibranchiate mollusks, of which Doris tuberculata is one of the largest and commonest species, are (like those of Lymnœus stagnalis and other fresh water snails) deposited in a mass enveloped in a jelly-like substance ; but, instead of the 50 or 60 eggs deposited at one time by Lymnœus, the naked-gilled mollusk will lay many thousands, and, in the course of the spawning season, will produce several hundred thousands of eggs. The substance in which these eggs are deposited also differs from that of the fresh water snails, being much more delicate both in colour and texture, and its perfect transparency makes it a suitable and interesting subject for the microscopist. In the example now under examination, the gelatinous envelope is in the form of a long ribbon of tolerably uniform width, attached by one edge to a piece of sea weed, and frilled or coiled spirally. When first deposited the jelly-like substance of this ribbon is filled with minute spherical bodies, each of which is in due time divided and sub divided, until a mass of yolk segments is formed within each ovum. It now becomes very interesting to watch the motion of the eggs, which are seen to revolve several times in one direction, and then several times in the opposite direction. This motion is caused by cilia which are now being developed on the anterior or cephalic portion of the embryonic mass. This portion grows rapidly, and in a short time the foot or muscular disk of the animal is formed. A shell is also formed in the posterior portion, into which, as soon as it is large enough, the embryo contracts itself. It is remarkable that the shell is thus formed during the embryonic stage of all the gasteropods, although in the case of the nudibranchs it is cast off after they leave the egg, and in some other families it continues to exist only as a thin calcareous plate imbedded in the substance of their muscular covering. The head of the embryo Doris becomes furnished with two membranous lobes, richly ciliated, and when the time arrives for its extrusion the egg case is ruptured and the young mollusk swims away

in its transparent and beautiful shell. The cilia just referred to are large and powerful, and the young Doris is enabled to move rapidly through the water. In time, however, the ciliary apparatus gradually disappears, and the animal has to content itself with slower modes of progression, either crawling among seaweeds and occasionally displaying to some delighted naturalist, as he gazes into the clear water of a shore pool, the exquisitely beautiful rosette which forms the breathing apparatus it carries on its back, coming to the surface and reversing its position, it will convert its large concave "foot" into a boat, and so swim away back downwards.

JUNE.

Mr. J. Fullagar described and exhibited a new Rotifer found upon the water plant, Riccia Fluitans.

I have had for a long time some of the Riccia Fluitans (a cryptogram) in one of my vases, some of which are decayed, and the chlorophyl, or colouring matter, had left the vegetable tissues quite clear and transparent. On placing some of the decayed weed under the microscope on January 21 of this year, I observed in it some round bodies of an amber colour, which soon became oval in shape, the contents of which were seen to move and turn half round and back again, a motion often seen in the interior of many rotifers, and in the ovum of many small animals, and I thought that probably these same round and oval bodies were eggs, which they ultimately proved to be. In course of time the round body of the egg, became oval and more egg-shaped, and in about three hours, from the small end of the egg, a sort of tube or shaft gradually protruded, and displayed a row of rather long vibratile cilia rotating on the top; the tube was quite as long as the oval shaped body, telescopic in its form, and could be withdrawn into the body. The jaws were placed at the bottom of the tube, and were plainly seen in action. When alarmed the creature would quickly withdraw the wheel of cilia and the tube also; then it would protrude first a sort of horn, and sometimes two, as a sort of feeler, previous to again displaying the wheel of cilia. These rotifers appear to be lodged in the cellular tissues of the plant, and at times they protrude their tube through the cells of the plant. The rotifers are very small; I made them out to be only 7-1000 of an inch in length. I tried to isolate one of them and to get it clear of the decayed vegetable matter in which the creature was imbedded; but this was a troublesome thing to effect, and I lost several in the attempt. The telescopic nature of the tube is very plainly seen either in the act of protrusion or retraction. At times the tubes will withdraw, and remain in a state of rest for five or six hours, and be then again put forth with the ciliated lobes, and continue to rotate for the same

length of time, and sometimes I have known them to continue in motion for over 12 hours. The last of them that I had under observation were four on one piece of the Riccia, and they kept alive and in motion, without any material change, until May the 1st, when they all withdrew the long tube and remained on the weed, in which quiet state they continued for fifteen days, when they again put forth a long and transparent tube, but no cilia or wheel was in motion, yet the two horns were very prominent at the top, nor were the jaws seen as before, neither were the tubes withdrawn in a telescopic form as at the first, but folded themselves down worm-like. Thus they continued for three days, and finally escaped into the water, when I lost sight of them entirely. They left the oval case, out of which they came, remaining on the weed.

AUGUST.

On the Sun-dew (Drosera Rotundifolia), by Colonel Horsley.

This specimen of "Drosera Rotundifolia," or round-leaved sun-dew, was discovered by Mr. H. Dean, of St. Peter's-street, at Hothfield Heath, near Ashford. In this plant the most remarkable part is the leaves, and the least remarkable the fructification. The former are nearly round and grow upon long hairy stalks; they are at first folded up in such a manner that they look something like green hoods, but they afterwards spread out into small concave disks, covered over with long, shining, red hairs, that secrete from their point a clear fluid, which gives the leaves the appearance of being covered with dew drops. This glittering dew-like secretion is most abundant when the sun is at its highest, and hence it has acquired its popular name of sun-dew. The apparatus by means of which the moisture is secreted, forms one of the most beautiful objects for the microscope. Let us take a single hair and place it under a magnifying glass, taking care to throw upon it from above a strong reflected light, and using the precaution of cutting off all the rays that come from below. You will now see that what seemed a little hair with a drop of water at its point, is really a long curved horn, transparent and glittering like glass, delicately studded from top to bottom with sparkling points; beautifully stained with bright green passing into pink, and mellowing into a pale yellow, as if emeralds, rubies and topazes had been melted, and just run together without mixing; and finally tipped with a large polished oval carbuncle, or ruby of the deepest dye.

I should mention that the above description of the leaf of the Drosera is taken from Dr. Lindley's Ladies' Botany.

The hairs of our British Droseras possess the power of closing upon insects and holding them fast. "When an insect settles upon them it is retained by the viscosity of the glands, and in a

little while the hairs exhibit a considerable degree of irritability by curving inwards, and thus holding it secure." (Henslow.) And Dr. Royle describes the phenomenon as occurring so obviously in an Indian species of sun-dew, that he had called it "the fly catching" in consequence.

Near the base of the leaf stalk is a long coarse fringe which is supposed to represent stipules. The flowers of the sun-dew, when expanded, are elevated upon a slender scape, along one side of the upper end of which they are arranged; but when young they are coiled up in a gyrate (or circinate) manner.

The Calyx consists of five sepals, a little glandular externally, and nearly as long as the petals. The petals are fine, snow white, flat, blunt, and spreading. There are five stamens, growing from below the ovary, opposite the sepals.

The ovary is a superior, oblong case, of one cell, and bears three clusters of ovules on its sides; it is surmounted by three forked stigmas. The fruit is a capsule, half divided into three valves, and enclosing a multitude of minute seeds. Each seed is invested in a loose membranous tunic tapering to each end, and contains a kernel filled with a large quantity of albumen, in the base of which is a minute two lobed embryo.

On Polyzoa, illustrated with diagrams and living specimens, by Mr. J. Fullagar.

The groups of polyzoas are among the most beautiful and interesting forms of invertebrate animals. They are chiefly inhabitants of the sea, where they may be witnessed under numerous plant-like forms, offering, even to the unassisted eye, an endless repetition of the same element of form, objects of surpassing symmetry and beauty. The polyzoa, however, are not by any means exclusively confined to the ocean, and though by far the greater number are marine, yet in the still and running waters of the land, in the rivers, ponds, and dykes, species are to be found which in interest yield not one jot to their brethren of the sea, and offer to the naturalist an inexhaustible source of gratification in the beauty of their form, and the wonders of their organization. The ponds and dykes this summer have not been very prolific in the production of the polyzoas, at least in this neighbourhood; nevertheless Mr. Dean sent to the last meeting some good specimens of the Plumatella repens, and since that we have found them in large quantities in the reed pond, from which the specimens now exhibited were obtained. In order to keep them alive in the cells for exhibition, it is necessary to feed them, and they will readily feed on monads, which are to be obtained at times from a rain water butt, or fish tank, where the water will appear of a green colour, which is

owing to the innumerable quantity of monads, though individually they are perfectly invisible to the naked eye. On these monads the plumatella feed voraciously, and as they are reduced by the action of the stomach in the process of digestion, the stomach becomes filled with a bright green-coloured matter. By referring to my diagram you will see that the mouth of the plumatella is surrounded by a number of tentacula, arising from a sort of stage or disk, termed the lophophore. These tentacles are covered with vibratile cilia, which, when in motion, have the appearance of passing up on one side of each tentacle and down the opposite, the rapid motion of which causes a current of water to set in, in the direction of the mouth, bearing with it the food requisite for the support of the animal. The whole course of the alimentary matter thus obtained, from the moment of its prehension to its final ejection, may be easily witnessed in many of the fresh-water polyzoa. If a polypide of plumatella repens be watched, while in an exerted state, different kinds of infusoria and other minute organic bodies may be observed to be whirled along in the vortices caused by the action of the tentacular cilia, and conveyed to the mouth, where many of them are at once seized and swallowed and others rejected. The food having once entered the œsophagus experiences in this tube no delay, but is rapidly conveyed downwards by a kind of peristaltic action, and delivered to the stomach. In the stomach the food is destined to experience considerable delays; it is here rapidly moved up and down by a strong peristaltic action, which first takes place from above downwards, and then inverting itself, propels the contents in an opposite direction. Every now and then the fundus of the stomach seems to perform some function distinct from that of the rest of the organ, in that it seizes a portion of the alimentary mass and retains it for a moment, by an hour-glass restriction, separate from the remainder, and then powerfully contracting on it, forces it back among the other contents of the stomach. All this time the food is becoming imbued with the peculiar secretion of the gastric walls, and soon assumes a rich green colour. After having undergone for some time the action of the stomach, the alimentary matter is delivered by degress into the intestine, where it accumulates in the wide pyloric extremity of this tube. After continuing here for a while in a state of rest, and probably yielding to the absorbent tissues its remaining nutritious elements, portions, in the form of oval-shaped pellets, become separated at intervals from the mass, and are slowly propelled along the tube towards the vent, where, having arrived, they are suddenly ejected into the surrounding water and rapidly whirled away by the tentacular currents. In all the fresh-water polyzoa, bodies of a very peculiar nature occur at seasons lying loose in the perigastric

space; to these are given the name of statoblasts. From the earliest period that the fresh-water polyzoa became an object of study, the statoblasts attracted the attention of observers. Their form is not exactly the same in the different species, they vary accordingly from an orbicular to an elongated oval figure, and are enclosed in a horny shell, which consists of two concave discs, united by their margins, where they are further strengthened by a ring which runs round the entire margin, and is a different structure from the disc. The ring is composed of cells, which are generally larger than the cells of the disc, and of a different colour; they are filled with air, giving the ring a light spongy texture, and act as a float, by which the statoblasts when free are kept near the surface of the surrounding water. When the statoblasts are placed under favourable circumstances for their development, they open by the separation from one another of the two discs, or faces, and there then escapes from them a young polyzoon, already in an advanced stage of development, and in all essential points resembling the adult individual in whose cell the statoblasts were produced. At the period of its escape it possesses all the essential organization of the adult; the retractor muscles are well developed and the polypied is capable of regular exertion and retraction. Another way by which the polyzoa is multiplied is by gemma, or budding, during the summer months. The first appearance of the bud is seen near the orifice of the cell, in the form of a minute spherical tubercle, which gradually increases in size, and is thus pushed out through the ectocyst, or external investment. At the same time the alimentary canal begins to form, the three regions of which, namely, the œsophagus, stomach, and intestines are easily distinguishable, and the full development is soon completed.

NOVEMBER.

On the Sea Mouse (Aphrodita Aculeata) by Mr. S. Saunders.

Aphrodita aculeata, commonly known as the sea-mouse, a creature whose habitat is deep water with a muddy bottom. On being brought up in the dredge the animal presents a strange combination of dirt and beauty. The body is clothed with a quantity of silky hair; that which fringes the sides being long, delicate, and of metallic lustre, reflecting the most beautiful prismatic colours, but the hair with which the back is covered retains on its surface a quantity of mud and slime. This hair is matted together, forming a substance like felt, which is quite detached from the body of the animal, and can be lifted by means of fifteen pairs of delicate plates, which shield the breathing organs ranged in a double row upon the back. A

space is thus formed between the gills and the hairy covering above described. The water, strained through the tangled hair, leaves the mud on the surface, and flows clear and pure over the delicate skin, which takes up the oxygen for the respiration of the animal. Although the appearance of aphrodita has suggested the common name of sea-mouse, it is really a marine worm, and the under surface of the body, which is smooth, shews the annulate structure clearly enough. Each segment is developed at the margin into a fleshy and muscular lobe, which serves both as an oar and a foot, propelling the creature through the water, or enabling it to crawl about its muddy home. These oars are furnished with bundles of stiff sharp bristles, which assist locomotion, and can be protruded from or withdrawn into their muscular sheath at the will of the animal. The body is also margined with several rows of bristles, stiff, shining, and of a purple colour, which appear to be weapons of attack and defence. Both the richly-coloured hair, and the stiff bristles are interesting and beautiful objects for the microscope.

On Honeydew and Aphides, by Mr. G. S. Saunders.

I wish to call the attention of the meeting this evening to a family of insects called Aphides, as I have some good specimens of one of the most interesting species, Erisoma mali, commonly called the American Blight, and as the whole family is interesting, not only to the entomologist and microscopist, but also to the agriculturist and gardener.

The Aphide belongs to the natural order Homoptera, which also comprises the Cicadœ, the Lantern flies, Frog Hoppers, and Scale insects. This family contains a very large number of species, and except in the Tropics, where it is almost unknown, is very generally distributed throughout the world.

There are very few plants which are free from their attacks; those, however, which belong to the natural orders, Fumariaceœ, Gentianaceæ and Iridaceæ are said to be entirely free from them, and Labiates and Cryptogamic plants nearly so.

The Aphides when in the perfect state are sometimes winged and sometimes wingless; they do not undergo their metamorphoses in the usual manner, of the perfect insect laying eggs, from which grubs, or caterpillars are hatched, which in due time become chrysalides, from which the perfect insects are produced, for sometimes the females lay eggs, and sometimes the young larvæ are born alive. These larvæ, whether hatched from eggs or produced alive, very much resemble their parents, but their legs and antennæ are much shorter in proportion. After various changes of skin they assume the pupa state, in

which condition they are but little changed; those, however, which are to become winged insects have the rudiments of wings.

Many persons think when they see a certain haziness in the atmosphere, which they call blight, that it is caused by immense multitudes of these insects, urging, in proof of their theory, the very sudden appearance at times of myriads of Aphides. No doubt plants which were a few days before, as far as could be seen, quite free from them, may be found covered with these insects, but on examination nearly all the Aphides will be found to be wingless, and quite incapable of flight. The real causes of plants being so suddenly covered by these insects are that a great number of eggs hatch about the same time, and that reproduction is effected in a wonderfully rapid manner.

During the summer nearly all the Aphides are viviparous, wingless females; very few males are to be found. About six days, and sometimes in less time, after they are hatched from the eggs, these females, having paired, give birth to young, who in about the same time become the parents of another generation. A viviparous female of the common Rose Aphis, Siphonophora rosæ, which I was watching under a microscope, gave birth to two young ones within half an hour. This is, however, I believe, an unusually rapid rate. Mr. Buckton, in his work on Aphides, says he has known eight to be born from one female in six hours, and has calculated that the living progeny of a Rose Aphis, supposing each Aphis lived 20 days and produced 20 young, at the end of 100 days would be 3,200,000, and at the end of 200 days 10,240,000,000,000 a number we cannot in any way realize. Professor Huxley has stated that if all the members of the tenth generation alone survived, and assuming that an Aphis weighs 1-100th of a grain, they, the tenth generation, would weigh more than 500 millions of stout men, or more than the population of China. When we consider these figures we can understand why our plants are sometimes so rapidly covered with these insects, and why our hops and other crops at times suffer so severely from their attacks; and we should be indeed thankful that owing to their natural enemies, which are very numerous, we are not more troubled with these pests. Another very curious fact about Aphides is that a female having paired, not only is she rendered fertile, but also her progeny for many succeeding generations.

The Aphides, whether in the perfect or immature states, live on the juices of plants, which they obtain with the assistance of a proboscis, or rostrum, which is composed of three joints. When not in use it lies on the breast or underside of the insect, between its legs. In some species it is larger than the insect, and what at first sight appears to be a tail, on closer examination turns

out to be the point of the proboscis. Projecting beyond the insect's body this instrument is not usually inserted into the plant, but serves as a sheath for those long hair-like organs which can be protruded from it. With these the insect pierces the leaves or stems, using them with a saw-like motion ; these organs, however, are neither toothed nor barbed, but a plentiful supply of sap flows from the incision which is sucked through the proboscis with a pumping action.

The Aphides have nearly all soft oval bodies composed of several joints; they are sometimes much wrinkled, when the joints are very distinct ; but in some species, when food is abundant, they become so distended that the joints are scarcely visible. Many species are furnished with two curious organs near the end of their bodies, called cernicles, which are longish tubular appendages, from which there occasionally issues a drop of sweet, sticky fluid. These drops falling on to the leaves or anything below the plants on which the insects are feeding, form the sticky substance commonly known as "honey-dew." Ants are particularly fond of this fluid, and will watch an Aphis, sometimes gently tapping its sides with its antennæ until a drop appears, which is immediately swallowed. The stories of ants carrying Aphides into their nests and using them as cows is probably the result of careless observations, for the Aphis would be unable to supply the honey-dew unless it could obtain an abundant supply of sap. Ants sometimes build their nests partly among the stems of plants, which stems may be covered with Aphides, from which the ants can obtain the sweet fluid they are so fond of. Certain species live underground, feeding on the roots of various plants. Some of these have, no doubt, been found in ants' nests, unharmed by the ants, who have probably made their nest at the root of some plant infested with these Aphides, these, however, have no cernicles, but probably something of a sweet nature may exude from them.

The American Blight is one of the most mischievous species ; when once it attacks an orchard it is a most difficult pest to get rid of, for it exudes from between the joints of the body a white cottony, sticky substance, which is very light and easily blown about, and often carries with it eggs and young Aphides, which form new colonies on neighbouring trees, so that it is a serious matter when this insect makes its appearance in an orchard. This cottony covering is, I imagine, a great protection to the insects, for many of their enemies would not be able to reach them on that account. I have been unable to find one of these Aphides in the winged state, but on the slides under the microscope you will see them in various stages. You may notice that the proboscis in the young ones is much larger in proportion than in those which are more mature, in fact so long that

it projects beyond the body. It can easily be understood how much a tree may be injured when thousands of these little insects are all pumping out its sap as fast as they can. The best way of getting rid of this pest is to place a cloth of some kind on the ground round the stem, so as to catch any of the insects which may fall off, and then to scrape the tree thoroughly and scrub it well with a stiff brush dipped in strong salt and water, turpentine, ammoniacal liquor, parraffin oil, or petroleum, taking care to collect and burn all the scrapings.

The injuries caused in our gardens and elsewhere by the Rose Aphis, the Hop Aphis, and many others are only too well known to every one. Fortunately the Aphides have a very great number of natural enemies, which, in a great measure, keep them in check; among these are some minute four-winged flies belonging to the family Ichneumonidæ, which pierce the bodies of the Aphides with their ovipositors and deposit within them their eggs; from these minute grubs are soon hatched, which make short work of the Aphis. Aphides may often be noticed which have become hard, globose, and of a dull colour. These have been attacked and destroyed by the Ichneumonidæ grubs.

The grubs of a family of two-winged flies (the Syrphidœ) kill great numbers of them. These flies are very common in gardens and may often be seen hovering in the sunshine under trees, at times appearing almost motionless and then suddenly darting away; they are generally of a dark colour, banded with yellow. They have the instinct to lay their eggs singly on some plant infested with Aphides. The grubs are about half an inch long, and when full grown are widest at the tail and gradually taper towards the head, which terminates in a point. The grub is blind and has no legs; its mouth is furnished with a kind of double hook, with which it holds its prey; raising the front part of its body it strikes right and left with its head until it touches an Aphis, which it at once seizes, and raising its head in the air sucks it completely dry in about two minutes and begins searching for another. Another very common foe is the larvæ or grub of the Ladybird, which is particularly useful in destroying them in hop gardens. Another desperate enemy of the Aphides is the grub of the common lace-winged fly (Chrysopa perla), which are very active six-legged insects, and are furnished with a pair of very long jaws, which they make good use of. They are very voracious and kill great numbers of Aphides. These three insects which I have just alluded to should always be encouraged as much as possible, as the benefit we derive from them is inestimable. Unfortunately these grubs are often destroyed by persons who, ignorant of their habits, imagine they must in some way be detrimental to the plants they are on.

DECEMBER.

On Raphides in Hydrangea Hortensis, by G. Gulliver, Esq., F.R.S.

Happily the microscope has now come into such common use that any addition to the manifold objects for it will have more or less interest; and all the more so if they should be always at hand and ready for our amusement and instruction. Among these is the familiar garden shrub Hydrangea hortensis. It is throughout pervaded by raphides, of which beautiful crystals, about a score in a bundle, are contained in an oval cell, such cells being scattered abundantly among the tissues of the plant, and easily seen under a low object-glass, and still better under a deep one.

Mr. Edgeworth originally mentioned to me the presence of true raphides in the leaves of Hydrangea. They may be readily exposed by smashing up a bit of the leaf in a drop of water on the object-plate. By boiling a fragment of the plant in a solution of caustic potass brings the raphides and their cells most distinctly into view; and they may be further prepared very well according to the processes recommended by our excellent member, Mr. Hammond, which he described in "Science Gossip," June, 1878, and exhibited specimens of the results thereof at former meetings of the Society.

But though interesting material for the microscope is thus afforded by Hydrangea, the raphides in this genus are noteworthy in a taxonomic point of view. In former communications to the Society, and elsewhere, now summarised and illustrated by two plates in the last edition of Professor Lionel Beale's "How to Work with the Microscope," I have shown how valuable raphides are as natural characters in systematic botany. And now they are further proposed as significant in relation to the position of Hydrangea. Though many of the best systematists have long persisted in placing it with the Saxifrages, some other eminent botanists, of whom Lindley was one, have doubted whether it belongs to this section, and, indeed, have seen nothing for Hydrangea but a distinct order. Hence Lindley's order Hydrangeaceae, chiefly distinguished by its opposite leaves. And now another and not less natural diagnosis is proved; for, according to my researches, the Saxifrages are destitute of raphides, while they abound in the Hydrangeas. Any person with a microscope may at once see these facts very plainly, and see, too, in them an additional argument for Lindley's conclusion.

Hydrangea hortensis, the deciduous shrub so common in our gardens, is a native of China, and was first introduced to Britain in 1740. The order contains but few species of much economic

value; only one, Hydrangea Thunbergii, has leaves, which are dried in Japan, and make such an excellent kind of tea, that it is known in that country as the Ama-tojâ, or Tea of Heaven.

This valuable paper was illustrated by some skilfully prepared objects by W. H. Hammond, Esq., of Milton Chapel, and also by Colonel Horsley in some freshly dissected leaves of the Hydrangea.

Captain McDakin contributed throughout the year a series of papers, on the Geology of East Kent, which were read before the several meetings of the Society, but which it has been thought desirable to print as a whole.

AN OUTLINE & INDEX TO THE GEOLOGY OF EAST KENT,

By Captain McDakin.

I propose in this paper to describe the facts I have observed, and the information I have collected from various sources, bearing on the geology of the district. Such an epitomised account may not only be of value to those who are entering upon this science, but the geologist experienced in another part of the country may find such local information a guide not to be despised, and more particularly as I intend to give the volume and page of the standard works and Geological Magazines in our own library containing information on the subject. Before entering into the geology I will describe the physical geography of the neighbourhood, taking Canterbury as a centre, which occupies a position marking the junction of two great geological periods, the Secondary and Tertiary, the former containing the fossil remains of reptilian life, the latter those of the true mammal. On the south east of the city the chalk of the North Downs runs in a line, only broken by minor valleys of denudation, to Dover, where it terminates in cliffs from two to four hundred feet in height. The general dip of the strata of the North Downs being to the north east, the Lower Chalk constitutes the principal part of the southern escarpment, running westward in a lofty range of hills through Kent, with their precipitous fronts to the south, and sloping gently with many undulations to the north. The rivers Stour, Medway, and Darent, have cut their way in the direction of the dip through the North Downs, the general direction of the course of the two former being north east, whilst that of the latter is north, or nearly at right angles to the strike of that portion of the escarpment. Two remarkably intermitting streams occur in the Canterbury district known as Nailbournes, one running through the village of Bridge, and the other through Petham. There are also two streamlets crossing the London road beyond Boughton, about five miles from Canterbury, that to the west being a Nailbourne. Ireland's History of Kent, vol. II., page 552. For full information of these curious streams see a paper by Mr. W. H. Hammond, published with the proceedings

of the Society for 1879. On the side of the valley opposite the Chartham Lunatic Asylum, there is a hill conspicuously marked by a clump of Scotch pines, not far from which is the parish school-house, which may be reached by way of a very pleasant footpath through Bigberry Wood. It is near here in the western corner of Bigberry Wood that some deep holes are situated, with subterranean streams that may be heard running at the bottom. I visited two of them and measured their depths by means of a stone tied to the end of a ball of string. They are from twenty-five to twenty-nine feet deep, and are very difficult to find on account of the thick underwood. A hole very similar to these suddenly opened at Wingham in February, 1877, to which I drew attention at the time. See report for 29th January, 1878, page 29. The holes in Bigberry Wood pass through the Thanet-sands for about twenty-five feet to the chalk. The Nicker Pits below Westbere are in peat and alluvium covering the Thanet-sands, so that some people have supposed that they are caused by the former springs issuing at a lower level. Both are probably only part of the much more extensive drainage of the uplands, and may so be related. The opening at Wingham is in loam covering the chalk. The Nicker Pits, which are not more than two hundred yards from the South Estern Railway, are irregularly shaped openings usually filled with water on a level with the spongy surface of the marsh, which undulates as it is walked across, and owing to its very loose and boggy nature renders it very difficult to reach the edge of these curious openings, the situation of which may be made out from the railway by some stunted willows and osiers planted round their margins. For further particulars respecting these peculiar wells, see an article, by Mr. John Brent, in the Geologist, 1860, vol. III., page 276, who ascribes their names to the "Scandinavian god Nikarr or Knickarr, in Christian times converted into old Nick, and so Nicker pits or the devil's pits." As this is rather a description of the physical geography than the geology of this part of the country, it will not be out of place here to mention that swallow-holes and blow-wells, as they are called in other counties, are accounted for by the chemical action of water containing carbonic acid in solution, which, flowing over a bed of loam or clay overlying limestone rock, is by such an intervening stratum prevented from acting on it, until by some accident it finds its way to the chalk. It then, first by chemical action and afterwards by mechanical, enlarges one of the natural fissures of the rock until a swallow-hole is formed. The mechanical action of water will sometimes drill a circular hole through rock of the greatest hardness, as may be seen under many water falls. It is very seldom indeed that water runs through a hole without a whirling motion; take, for instance, the familiar example of water making its exit from a sink. When this occurs on a larger scale in nature, stones

and pebbles caught in the whirlpool constitute a drilling machine of great potency. Swallow-holes may in this manner be formed. The formation of a blow-well may be accounted for by supposing that a bed of clay or other impervious stratum exists under the chalk or limestone rock, only in certain places permitting the water to act chemically on the limestone above it, and thus having been formed into a cylindrical column of water, it pierces its way like a fountain jet through the beds above it, mechanically and chemically removing from them their natural cement of carbonate of lime or alumina until they in many instances assume the form of quicksands. The spring in a stream under the London, Chatham, and Dover Railway viaduct, known by the name of the Silver Hole, has probably gained its name from producing in this manner the fine white silver-sand at its bottom. But neither of these modes by which water acts is necessary to produce such pits as those in Bigberry Wood or at Wingham; a subterranean stream is quite sufficient for the purpose. The beds of loam being of a homogenous nature the falling in of material from above takes place equally on all sides, so that the hole is more or less cylindrical; in some cases remarkably so. There are two instances where such holes have been produced artificially in the field below the Canterbury Union, and just above the chalk pit, where two tunnels driven from the face of the chalk have fallen in, producing in one case a circular pit, the other being of irregular form, but neither conforming to the elongated shape of the tunnel underneath. When an underground stream occurs it plays the part of a carrier of the loose material that falls from above, brought down by the trickling of water very often through a hole caused by the root of a tree, roots sometimes running down many feet to reach a moist stratum, and decaying on the death of the tree. A natural duct is thus formed for the surface water, which spreading out by capillary action, as it sinks lower causes a dome-shaped cavity in some instances to be formed; this suddenly giving way would account for such openings as that which occurred at Wingham in a few hours. So that such underground streams play the necessary part of removing the particles, as they fall in, and without the presence of which openings of the kind could not exist. Besides such natural pits, there are a number of circular ones in the district known as draw-wells sunk for obtaining chalk for agricultural purposes. These being sometimes situated in woods and overgrown by brambles and underwood, form dangerous traps for unwary naturalists. People have in many instances fallen down them, and I am indebted to our Assistant-Secretary, Mr. Fullagar, for the following narrative respecting a young girl who fell down one near Lenham within his recollection, and after remaining in it for a fortnight, having but the rainwater that trickled down its sides to quench her thirst, she was rescued by an old man and a boy, going

to their work. It appeared that the boy had long wished to look down one of these places, but had been warned by his father not to go near them; he, however, teased until permission being granted he ran to the hole, and looking down called to his father that there was someone at the bottom, who seems at first not to have believed it. The poor girl on being recovered from her lost situation, stated that she could hear the carts rumbling in the neighbourhood, and even the voices of people after her own had grown too weak to make herself heard; she also heard the bells ringing on the occasion of the rejoicing on the acquittal of Queen Caroline, as well as the people shouting. As she was a servant girl, and left her place without her friends' knowledge, and the people with whom she had lived supposed she had returned to her home, no enquiries were made about her. Her death has been recently recorded in the local papers, so that she must have survived the accident for many years.

Travelling north and north-west from Canterbury we encounter the sands and clays of the Tertiary period, filling up depressions partly of subsidence and partly of denudation, but rising in hills of considerable elevation as at Dunkirk and the Blean. Detached portions of the tertiary occur westward, as at Shottenden, and from Boughton under-Blean to Faversham, Chatham, and Upnor, until on reaching a line running north-east through Bromley and Erith we again encounter them, when they constitute a continuous formation beyond the borders of Kent, extending to about twenty miles west of Reading. The unbroken tertiary beds in the neighbourhood of Canterbury may be considered to be bounded on the south by the London, Chatham, and Dover Railway from Selling station to Bekesbourne, then in a line running north-east through Littlebourne and Wingham, tending south-east by Staple, north of Eastry, to about half-a-mile east of Worth. On the east by a line drawn across the low country, separating the Isle of Thanet from the mainland and passing through Sandwich and Richborough Castle to Red Cliffs' point in Pegwell Bay. The Tertiaries being concealed beneath the alluvium of the marshes only show themselves on the southern boundary of the Isle of Thanet, about three miles along the South Eastern Railway near the Minster station, with a few isolated beds, as at St. Peter's brickyard, on the London, Chatham, and Dover Railway; Newton, near the St. Lawrence station on the South Eastern Railway, and at Spratling Street, half a mile north-west from the St. Lawrence station. The main body may therefore be considered to be bounded in this direction by Richborough, Stourmouth, Grove Ferry, and Reculver church. The northern boundary is formed by the sea coast to Whitstable, and the western by a line running southward from the latter place through Graveney, Hernhill, Boughton, and Selling. The Isle of Sheppey is composed of a mass of London clay, in some places

450 feet in thickness, the cliffs on the north coast affording excellent sections of this tertiary deposit. The Bagshot Sands are represented to a limited extent in Sheppey, being geologically interesting as showing the upward extent of the London clay. The London, Chatham, and Dover Railway, from Bekesbourne, near Canterbury, to the Crystal Palace, on the western borders of Kent, may be taken roughly as the southern limits of the tertiary deposits of North Kent. In the immediate neighbourhood of Canterbury they are still principally covered by the forest of Blean, partly owing to the cold and unproductive nature of the London clay. The scenery they give rise to, though still undulating in some respects like the chalk, has not the peculiar swelling outlines of the latter, nor when covered with grass, its crisp short herbage. The alluvium of the river valley, with the gravels, brick-earths, clays, and peat, belongs to the subsequent or quarternary period, and by filling up the valleys causes them to retain the level appearance of the water that once occupied them. The gravel beds lying on the hill tops near Harbledown, Bigberry Wood, and the Old Park, above the Barracks, and several places in Blean, appear to have formed caps, which have resisted denudation taking place to the same extent as it has on the undefended surfaces, and thus occupy elevated positions. (See annual report for 1878.) On the north coast the yielding nature of these tertiary deposits has occasioned considerable loss of land. Herne Bay has long ceased to exhibit the characteristic geographical features that its name would indicate. During the historical period a great deal of land has been swept away in the neighbourhood of the Reculver Church, for in Henry the VII.'s reign it is stated to have been nearly one mile from the shore. In 1780 the walls of the Roman camp, eighty yards nearer the sea than the church, fell down, although they had long projected over the edge of the cliff there about twenty-five feet above the sea, held together by the Roman cement. (See Topographica Britannica.) In 1804 the churchyard, with some buildings, were washed away; until this time the church seems to have been used as a place of worship. The Isle of Sheppy, about six miles long by four broad, with cliffs on the north coast of from sixty to eighty feet in height, lost fifty acres in the twenty years between 1810 and 1830. Minster church, now near the coast, is said to have been in the middle of the island in 1780. The loss of land on the north coast of the Isle of Thanet is about two feet in a year and on the east coast three feet. (For some very interesting facts regarding the waste of the coast, see Lyell's Principles, vol. 1, page 522 to 530.) Roman ships sailed between the Isle of Thanet and the mainland. Bede describes this channel as being about three furlongs wide, in the beginning of the 8th century, and it appears to have silted up about the time of the Conquest. The Goodwin Sands are traditionally said to have been once an island called Lome, suddenly overwhelmed by

the sea in William II.'s reign. In their present condition they are about ten miles in length by four in breadth and are separated from the coast by a channel varying from three to four miles in width. The Trinity Board in the year 1817 found by boring fifteen feet of sand, resting on blue clay, chalk was subsequently reached, but it does not say at what depth. In a paper read before the Society of Civil Engineers, in 1851, by Mr J. B. Redman, it is stated that Dover Harbour was once an estuary, the sea flowing up the valley to the westward, and at the beginning of the first century there was no shingle under the cliffs. As late as Henry VIII.'s reign, the sea washed the base of the cliffs, where now part of Snargate-street stands, and an anchor was dug up at Buckland. From the well-known south-east headland of Shakspear's cliff there was an immense landslip in 1772, and another in 1810, by which Dover was shaken as by an earthquake. Passing westward along the magnificent line of cliffs between Dover and Folkestone the destruction of the coast is apparent on a grand scale. These lofty chalk cliffs, four hundred feet in height, have their foundation on the slippery Gault Clay, whose unctious properties the naturalist will need but little persuasion to believe in, if he should be caught in a thunder shower, as the writer of this paper has been when climbing over its uneven surface. Portions of the cliff becoming detached from time to time, principally owing to the action of the rain, they either fall down or slip forward over the clay, sometimes moving bodily forward like a ship launched upon the greased ways. In the Phil Trans. for 1716, a great subsidence of the cliff is recorded to have taken place at East Wear Bay, near Folkestone. Houses that had not before been visible from the sea were exposed to view. In this manner the picturesque undercliff has been formed, being geologically similar to that of the Isle of Wight. Movements from time to time taking place, the yielding and partially plastic clay is forced up into a variety of contorted forms by the pressure of the immense mass of the cliff forming hills and valleys, like a mountainous country in miniature, small lakes adding to the resemblance to such an extent that this place is called Little Switzerland. In very dry weather the movements are nearly or quite suspended, but when saturated with water are more considerable. Footpaths that exist at one time are at another interrupted by yawning fissures or stopped by the up-throw of abrupt walls of chalk or hardened gault. The accident arising from these causes which befel the South Eastern Railway in the early part of 1877 is fresh in our memories, when the eastern end of the Folkestone tunnel, under Martello Tower number one, was so far displaced that it fell in, and about half a mile nearer Dover a fall of the cliff filled up the railway cutting with between two and three hundred thousand tons of chalk. Soon after this accident took place I went over the scene of the disaster with an intelligent coastguardsman who told me

that he saw it happen, and exclaimed to his companion, "Why, the cliff is coming down!" when like a big gun going off—I use his own expression—it fell like a straight bar, the upper portion filling the cutting, overwhelming two of the watchmen on duty at that part of the line. A wire fencing ran along the top of the cutting, which is about twenty-five feet deep. The coast-guardsman told me that he saw the watchman on the upper edge turn round, take hold of the wire, and look up, when he was swept away, and he and his fellow watchman, who was at the bottom of the cutting, were instantly buried under the chalk that filled the cutting to the top, some passing over into the sea. As it is not easy to estimate the height of these cliffs, which are about four hundred feet, it is difficult to believe it possible that at this place a fall of rock could reach the cutting, as the railway was separated by a small valley from the base of the cliff which the *débris* had filled up. It is also peculiar that it fell over like a rigid bar, for when the column in the Place Vendome, Paris, was pulled over, it broke up in the air when it had assumed a certain angle, and the fragments fell near its own base The South Eastern Railway, after a great expenditure of labour, succeeded in repairing the damage and securing their line. At Folkestone an ancient church and St. Mildred's nunnery were destroyed by encroachments of the sea in the seventh century. For the naturalist I know of no place presenting greater advantages for a field day, or more beautiful than East Wear Bay, or, as it is sometimes called, Little Switzerland, and an additional advantage is afforded by its being within a quarter of an hour's walk from the Folkestone Junction railway station, by a field road and path in the direction of No. 2 Martello Tower.

The sea, as if possessed by some sense of justice, restores to the land in one place that which it has robbed it of in another. Headlands are swept away but bars are formed across the mouth of rivers and bays, which then are liable to silt up, as at Dover, Romney Marsh, and Pevensey Bay, in Sussex. Hythe, the name signifying a haven, is stated to have been a place of great maritime importance, and that the sea even there at one time made great encroachments, although it is now some distance from the coast. The accumulation of silt and shingle forming Romney Marsh, ten miles in width by five in breadth, commences here. Mr. Redman states that this great accumulation is composed for a distance of about two miles of undulating ridges marking the periodical accessions made to the coast, like the rings of growth in timber. (See Lyell's Principles, vol. I, page 528.) The annual gain of this part of the coast has amounted to as much as eight yards in a year. As the cause of this accumulation of shingle and silt has been attributed by some to the set of the tides which have their mean place of meeting in a line drawn between Dungeness and Boulogne, and

by others to the river Rother forming a succession of the bars, it is highly probable that both influences are at work bringing about this result. Rivers loaded with the spoil of the land they drain, if flowing into a lake or tideless sea, form a gradually increasing delta, the suspended matter, being uniformly deposited, depending upon the rate at which the river flows. The waters of some of the great rivers of the world discoloured by sediment are traceable far out at sea. Colonel Sabine states that the waters of the Amazon may in this manner be perceived three hundred miles from land, entire deposition only taking place when the flow of the water ceases. In tidal rivers this takes place on the levels becoming equal and the momentum of the two streams of water balancing each other, when the mud is deposited in a surprisingly short space of time and a bar commences to form. Advantage is taken of this fact to produce the warp lands, as they are called, on the fens of the Trent valley in North Lincolnshire, where the muddy water of the river Trent is admitted by sluices over the adjacent lands, deposition of the rich alluvial matter taking place a few minutes after the gates are closed so as to allow the water to come to a state of rest. This being one of the great but quiet operations of Nature it is apt to be overlooked, and it is very probable that it has played an important part in forming this addition to the county of Kent. Rivers from their sources to the sea pass through the varying conditions of waterfalls, cataracts, and rapids, to the more sluggish reaches of their lower course. Waterfalls cut their way back until they only exist as cataracts or are reduced to rapids. Ravines with steep sides are cut through the harder rocks, whilst the softer strata yielding more readily to the effects of frost and rain form open valleys. The upper and more rapidly flowing portion of a river deepens the bottom of its channel, but the opposite effect is produced in the lower reaches where the slowly flowing water deposits sediment on its bottom and on either side in overflowing, until the bed of the river becomes raised to such an extent that it is frequently at a higher level than the surrounding country; for example, when sailing on parts of the Mississippi the adjacent land appears much lower than the surface of the water. The vast alluvial plain and delta of that river is computed to contain 30,000 square miles. (Lyell's Elements, page 22.) On a smaller scale similar results have in like manner been brought about in the valley of the Stour. In the city of Canterbury, ancient remains at a depth of eight feet show that a great accumulation of soil has taken place. Our assistant-secretary, Mr. James Fullager, has in his possession some charred corn, taken up from a depth of eleven feet, in the High-street. When the Arundel tower of the Cathedral was rebuilt about 1825, it

is stated on good authority, that in the excavations made for the purpose of laying the foundations, the skeleton of a man and ox were found imbedded in peat, fifteen feet below the surface they were in an upright position and were probably lost in the morass that once bordered the river. Other relics too numerous to mention could be cited. Though Canterbury has been subject in past times to inundation this depth of earth is principally due to the accumulation of road-making material and rubbish. As it is improbable that the early inhabitants would erect buildings of any importance on land liable to be frequently flooded, we may conclude that the mean level of the river is higher now than it was once, although lower than it was before the water-way at the Westgate bridge was widened a few years ago. The travelling of the shingle from the westward is also a well-known fact, as it will be found to be heaped up on the west side of the wooden groins on the south coast; this being the effect of the prevailing south-west gales and set of the surface drift it will serve to indicate the cause of the great extent of shingle beach. The ordinary force of the wind is quite insufficient to move a leaden bullet, but when fired perpendicularly from a gun a slight breeze is sufficient to deflect it so that it will fall to leeward of the point of fire. If in place of the propelling force of the powder we put that of the wave and for the wind substitute the flow of the tide, we may account for the translation of the pebbles along a shore for any distance. When a pebble on the beach is raised by the action of a wave it falls down again in the same place or is swept up and down the sloping shore in a straight line, but when there is a flow of the tide in a direction parallel to the shore the pebble in rising and falling will be carried, it may be only the fraction of an inch, in the same direction until it arrives at a meeting place of the tides or the stream at a river's mouth, when in the latter cases a bar will be formed, or in the former a pebble ridge at an angle to the shore. The meeting place of the two tidal waves, (the one flowing from the Atlantic round the northern shore of Great Britain, and the other round the southern) varying from hour to hour between Beachy Head and the North Foreland, may be considered as mainly instrumental in producing the wide expanse of silt and shingle forming Dungeness, although as before mentioned the river Rother, and other streams have doubtlessly played their part in bringing together the washing of the land forming the silt, as the pebbles are evidently the effect of wave action. For the Channel tides see Proceedings of Geological Society for 1877, vol. xxxiii., page 31. Rye, near the south-western border of Romney Marsh, now two miles from the coast, was once destroyed by the sea. Winchelsea, in Edward I. reign was likewise destroyed, the river Rother being forced

into a new channel. Near this place a ship, supposed to be Dutch, was dug out of the marsh land. The wood of which it was built proved to be oak, and was blackened in the same manner as the bog wood which is dug up from time to time in the peat of Romney Marsh with large quantities of hazel nuts. See Lyell's Principles, vol. I., page 529. In the adjacent county, the haven of Pevensey Bay has long been choked up with shingle. In other places around the coast of Britain many examples could be given showing that where the level of the land remains stationary the effect of the sea is to reduce the headlands, to fill up bays, and form bars at the mouths of rivers. The accumulation of small shingle and shells, covering the peculiar tongue of London Clay running out in the sea at Whitstable, has most probably been formed in this manner. It is known as the Street-stones, ancient remains being marked there in the ordnance map. Submerged forests do not occur on the shores of Kent to the extent that they do on other coasts, such wood is, however, thrown up from time to time on the coast near Whitstable. Mr. John Brent, in the Geologist, vol. iv., 1861, page 391, states that this wood is as black as ebony, the pieces being sometimes large enough to be used for gate posts. The fossil wood of the London Clay cast up on the same beach is sufficiently distinguished from the former by the organic matter having been almost entirely replaced by pyrites. I have recently been informed by Mr. George Dowker that he has known pieces of peat, bored by the Pholas, thrown up after a storm on the coast near Sandwich. These evidences of the changes of level that the land must have undergone, together with the effects of marine, and river action, caution us not to attribute to one cause alone the present condition of the coast line. It must not be overlooked that the changes of level caused by subterranean movements have been the initial cause of the flow of rivers but that the features of the landskip as we at present see them have been carved out principally by running water. The comparative great effect that a small runnel of water will produce may be seen on the coast near Reculver, where several chines or ravines are now in the process of formation by most insignificant streams, some of them being only the water draining from the open furrows left in ploughing. In this manner being able to bear witness to the effects of running water at the present time, it is not difficult to understand how a stream of the volume and velocity of the Stour, has in thousands of years cut its channel to lower levels, and excavated its valley. This action at first would be rapid the surfaces being unprotected by vegetation, but would decrease until the slopes assumed the angle of rest, of the materials of which they are composed when the degradation of the land surfaces would be

very much slower, but must be always going on so long as the rain falls and the river flows.

Having considered the salient features of the county to the northward of Canterbury and the coast-line from the Isle of Sheppey to Dungeness, in their relation to the geological structure of the district, we may by following a line drawn in a southerly direction to Hastings, continue an instructive field sketch of the surface geology. About ten miles from Canterbury in this direction we reach the southern escarpment of the chalk, which forms a bold line of inland cliffs rising in places, as at Folkestone-hill, to a height of 547 feet, surrounding the Weald of Kent and Sussex, to make use of a military simile, like the outer line of a fortified position with an inner line of rampart formed by the Lower Greensand. The two valleys of the Gault and Weald clays, forming the ditches between each escarpment and the Hastings sands, which latter may be supposed to represent the citadel. The whole Wealden area being in this manner surrounded on the north, west, and south, the sea has cut through all the formations without respect to their lithological character on the eastern side, thus completing the imaginary line of defence.

Carrying out the analogy of a fortified place the five rivers on the north, the Stour, Medway, Darent, Mole, and Wey, and the four corresponding ones on the south, the Cuckmere, Ouse, Adur, and Arun, form as it were, by the valleys they have excavated, so many sallyports. Returning to the chalk escarpment between Folkestone and Ashford, we may look across the two valleys indicated, to the central high ground of the Hastings sands. The chalk escarpment bears such a strong resemblance to an old sea cliff against which the waves at one time beat, with all the coast-line features of bay and headland, that such a conclusion with regard to their formation seems inevitable, but we should not be justified in concluding from mere appearances such to be the case. Sea cliffs are cut by the ceaseless action of the waves independently of the strike or dip of the rocks, frequently at right angles to the strike as at Dover, Folkestone, and Beachy Head, no bays of any considerable depth being formed even where the coast consists of the softer strata composing the valleys of the Gault and Weald clays. The sea generally leaves evidence of its action in shingle, sands, and the countless remains of the living things of the sea. Combes, those peculiar semi-circular hollows in the chalk escarpment, do not occur in the chalk cliffs, now washed by the sea. From the nature of the chips left by a carpenter we may judge of the tools that he has been using, the sawdust, shavings, or chisel chips, are evidence of the tools that produced them, but when the broom has swept all such traces away we have only the

finished work to tell us of the instruments that formed it. If the sea produced these inland cliffs as we now see them, all evidence of shingle beaches and other remains have ceased to exist. If it was once a tidal estuary, of a shape so peculiar that there is no parallel, subangular gravel instead of shingle may have been formed, but even then we should expect to find beds of seasand and marine remains; throughout the Weald, however, nothing of this kind has been found. The nature and dip of the rocks, in short, the geology of the district, must be taken into consideration before we can rightly estimate the causes that have brought about this remarkable configuration of the country. After leaving the chalk escarpment in travelling southward we encounter in succession the valleys of the Gault and Weald clays, separated by the inner escarpment of the Lower Greensand, or as it is sometimes locally called the "rock range," the woods which cover its drier soil forming a pleasant contrast with the naked valley of the Gault and the bleak chalk downs, but bearing a similarity to the latter in sloping gradually to the north with a precipitous front presented to the south. The valley of the Weald clay extends like an undulating plain between the Lower Greensand range and the central Hastings sands, which are frequently argillaceous, although their name would signify that they are arenaceous. They have been distorted and faulted to a much more considerable extent than the more recent formations. Then turning back again to the north we may take the rocks in ascending order from the Purbeck Beds (the lowest member of the Wealden), the Ashburnham beds, the Ashdown sands, Wadhurst clays, and Tunbridge sands, to the Weald clay. The names of these beds almost sufficiently explain their lithological character. The Purbeck beds are classed by some authors with the Oolite (see Lyell's Elements, page 375). Their chief development occurs in the Isle of Purbeck, hence their name; the quarries of this rock have furnished the well-known marbles for many of the English cathedrals. Fine sections of the lowest beds of the Hastings sands occur in the white "Sand-rock" of the Hastings cliff. Although these beds are beyond the boundaries of the county of Kent they are linked to it by belonging to the Wealden formation. At Tunbridge Wells the scenery is in marked contrast to that of the Weald clay valley, and must strike the traveller on the S. E. Railway which runs along that valley from Ashford to Tunbridge, where it passes by a short tunnel through a northern promontory of the Hastings sands. Some of the hardened beds have weathered into very curious forms at Tunbridge Wells, as the Toad-rock and High-rocks. Small pebbles of rock crystal found in them, after being cut and polished, are sold for Tunbridge Wells diamonds. The most important

mineral however is the ironstone, which occurs in two beds of about one foot to two feet in thickness, in isolated patches between Tunbridge Wells and Hastings. It was mined by sinking shafts to about twenty feet in depth, and then driving tunnels radiating horizontally into the beds; when the length of these became inconvenient they were filled in and fresh ones opened. In this part of the country the old mill ponds used in connection with the requisite machinery for producing iron may still be seen; much of the old ironwork in the neighbourhood was obtained in the district. To use a term not logically correct some of the old tombstones in the churchyards are made of iron. Roman remains found under slag heaps attest the tradition that iron was smelted here from the earliest times, even it is said before the Roman period. But the first direct historical notice is that of a charter being granted to the people of Lewes in Henry III.'s reign, to enable the inhabitants to levy toll on all carts laden with iron passing through the gates of the town. In Edward II.'s reign three thousand horse shoes were ordered for the expedition against the Scots, terminating on the field of Bannockburn. In Henry VIII.'s reign the first cast iron gun ever made in this country is claimed as having been constructed at Buxted on the borders of Kent, which perhaps excited as much interest at the time as the manufacture of a modern "Woolwich Infant" does now. It is somewhat remarkable that the biggest iron guns that the world has ever seen are still made in the same county. Historically later the heavy iron balustrades that once surrounded St. Paul's Cathedral were made at Lamberhurst, and cost eleven thousand pounds, but when the Earl of Dudley began to manufacture iron with coal, at Dudley, in Staffordshire, this industry of the south gradually declined until the last iron furnace was blown out at Ashburnham in 1828. This iron was of a superior quality, as it was produced from charcoal, furnished from the extensive forests that once clothed the Weald, and from which is said to have been derived the name of the Weald, Wold, or Woodland. In ascending order the highest formation of the Wealden is next encountered, namely, the Weald Clay, forming the wide valley between the Hastings sands and the Lower Greensand range. It is lithologically most remarkable for containing beds of the marble known as Petworth and Bethersden marbles. Like the ironstone it also occurs in patches, thinning outwards from the centre to the edges, and is supposed to have been deposited in lakes that once occupied hollows in the surface of clay. It is generally coarser in its character than the Purbeck marble. Several doorsteps of cottages in Canterbury are made of this marble, as well as some of the old altar slabs of the churches, which at the Reformation were taken down and made into tombstones and

subserved even lowlier offices. Bethersden church and the walls surrounding it show vast quantities of the casts of the fresh-water shell Paludina, and the roads are mended with the same stone picked off the adjacent fields, the fossil casts sometimes being those of another fresh-water mollusc, the Unio Valdensis. The mineral Heavy-spar, or sulphate of barytes, occurs in this clay, some crystals of which I obtained from a septaria which I found at Sandown Bay, in the Isle of Wight. I have also some larger crystals of the same mineral from this formation. (See Annual Report for 1878, page 28) In the succeeding geological formation the fresh-water fossils of this period give place to those that tell us that a deep sea rolled over the Weald, and the land fossils which it occasionally contains are but the waifs and strays swept out by the rivers to the sea.

The casts of the fossil shells showing so conspicuously in weathered specimens of the Bethersden marble, or sections of them cut through at varying angles in polished slabs, belonging to families of freshwater mollusks, and the remains of a minute crustacean, the Cypris Valdensis, modern representatives of which abound in ponds at the present time, and have this year formed objects for microscopical investigation under the instruments of the East Kent Natural History Society, show that the Weald clay is a fresh-water formation. It is stated in Lyell's Elements, page 346, that these minute fossils occur in such abundance in some of the beds that they give them the appearance of micaceous clay. So through all the Wealden, from the Ashburnham beds (in ascending order) to the Weald clay, the fossil remains tell of a fresh-water or estuarine origin. In the calcareous sandstone near Cuckfield, in Tilgate Forest, the first remains were found of the huge herbivorous reptile called the Iguanodon, so named from the resemblance of the teeth to those of the modern Iguana (pronounced I-gwaw-na), or in India commonly called the Gwana. The modern reptile clips off the herbs on which it feeds without mastication, whereas its gigantic fossil forefathers ground down their teeth to stumps in chewing their forage. It has been computed that some of these creatures must have been not less than fifty feet long. The largest thigh bone found measured four feet eight inches in length, and 25 inches round the narrowest part. That they were at one time very plentiful may be concluded from Dr. Mantell having personally inspected no less than the remains of seventy-one distinct individuals. These animals, so far as size was concerned, must have been the monarchs of their time, and with their gigantic proportions and thick skins it is unlikely they could have fallen a prey to other creatures, and must have lived out their span of life without either eating or being eaten by the other giants of their day; nevertheless, in the extremes of youth or old age, this huge lizard may have fallen a prey to some large

carnivorous reptile, such as the Megalosaurus, whose immense size and formidable teeth could never have rendered him a desirable neighbour. Dr. Buckland, in speaking of the teeth of the Megalosaurus, likens them to a combination of the contrivances that human ingenuity has adopted in the construction of the knife, the sabre, and the saw. Many others of the same order existed, as the Hylœosaurus, Plesiosaurus, and though of much smaller size, but if possible, of still stranger appearance, must have been the flying reptile, the Pterodactyle. The remains of fresh-water fishes are also found, allied to the Lepidosteus, or Gar-pike of the American rivers, covered with bony enamelled scales, which have given from their shining appearance, the name of ganiod to the order to which they belong. The frequently occurring shells, Melanopsis, Melania, Paludina, Cyrena, Cyclas, Unio, &c., also tell of fresh-water or estuarine conditions. In Ecclesbourne glen, near Hastings, slabs of red sandstone may be seen with the ripple marks of the waves that once flowed over them when they were yielding sands, and Lyell mentions that at Stammerham, near Horsham, specimens of sandstone occur on the underside of which are the reticulated casts of the sun cracks that once existed in the clay beds they covered when the latter were exposed to the sun and air, and cracked open as we now see the footpaths over clay lands in the dry summer weather. In the Hastings Sands, near Tunbridge Wells, remains of fossil plants occur in the upright position in which they grew, the fine fronds of Sphenopteris being preserved by the sand which drifted around them. At Cuckfield, beds of conglomerate, containing water-worn pebbles, with the rolled bones of reptiles, tell of the proximity of land and of the shallow estuary into which such remains were carried by powerful streams. For much information respecting the Weald we are indebted to Dr. Mantell, Sir Charles Lyell, Phillips, and to various writers on the same subject whose papers are scattered through the journals in our own library, and for many leading facts I am personally indebted to Mr. J. B. Sheppard, of Canterbury. I have been led beyond the boundaries of the county of Kent in tracing the characteristics of the Weald, because we have to avail ourselves of such sections as present themselves, in wells, railway cuttings, and sea cliffs, but which are typical of the same formation within the county. The Wealden shows by the evidence of its fossil remains, that the whole of this large tract of country must have been the delta of some great river; and when we consider the extent of those of such rivers as the Ganges or the Nile, that of this formation within the area comprised between the North and South Downs, of about forty miles from North to South, and eighty from West to East, is comparatively limited. The succeeding formation which we encounter in travelling Northwards, known as the Lower Greensand, though of marine orgin, in this district contains much drift

wood, bones of reptiles, pebbles of quartz, jasper and slate, with mica and grains of "chlorite," which from the prevailing colour of the latter has given to this series of beds the name of Greensand, but as it varies considerably in its lithological character and is apt to be confused by the similarity of its name, with the upper Greensand, continental geologists have called it the Necomian, from the ancient name of Neufchatel (Necomum) in Switzerland, where it is very fully developed. The harder nature of its rocks has caused it to resist denudation, to a greater extent than the clays to the North and South of it, so that it now forms the second line of escarpment running round the Weald, and even over-topping the North Downs at Leith Hill near Dorking, where it attains the height of nearly 900 feet. Locally it is subdivided in ascending order, into the Atherfield clay, Hythe-beds, Sandgate-beds, and Folkestone-beds. Subsidence in the old delta seems to have taken place until the fresh-water mollusks died out, and gave place to those which were exclusively marine. The fossils of the Atherfield clay belonging to the latter type. The Hythe-beds contain the famous Kentish Rag so largely used in the neighbourhood of Maidstone for a building and road making material. Margret Plues, in her excellent little book on geology, states, the lime it makes is of such superior quality, that when the centre arch of Aylesford bridge was removed, it had to be destroyed by gunpowder. Rochester Castle and many of the London churches are built of this stone. These harder strata are succeeded by the softer clayey Sandgate-beds, and these are replaced again by greensands, hard silicious limestone, and chert bands, so conspicuous in the East Cliff of Folkestone. The fossil proper to the lower greensand are marine, but as before mentioned the river which formed the old Wealden delta still continued to carry into the sea the drift wood, and bones of reptiles, that we now find fossilised in the lower greensand, which must therefore have been deposited not very remotely from the land which that river drained. Thus the most perfect remains of the great Wealden reptile, the Iguanodon, were found in a quarry of Kentish Rag, near Maidstone, by Mr. Bensted. The fossil wood occurring in such large quantities at Copt Point, near Folkestone, is sometimes found to have been perforated by boring molluscs. The woody fibre in some examples I have examined has been almost entirely replaced by mineral matter, only six per cent. of carbon remaining (instead of fifty, the quantity contained in most woods), with eight per cent. of moisture and forty of phosphate of lime. Wood contains a minute quantity of phosphate of lime, but here we find an amount equal to that which we might expect in animal remains, bones of animals and fish containing over fifty per cent of phosphates. The source of the phosphates in the lower greensand, is probably the highly fossiliferous overlying Gault Clay, which contains numerous spherical bodies

sometimes called turtles' eggs, one explanation of these strange bodies being that they are not turtles' eggs at all, but the shrivelled up bodies of the Belemnites, the extinct representatives of the cuttle fishes, who left their tails behind them in countless numbers, the egg like part containing forty per cent. of phosphate of lime. By that process (of which we find several instances, as substitution of iron pyrites, sulphate of lime, carbonate of lime, and silica, for organic matter in fossils), the skeleton of the former wood has been left with a body strangely transformed into a mineral, that might be suspected in animal, but least in vegetable remains. Some very interesting information respecting these beds is contained in the Geological Magazine, N.S., vol. I., 1874, page 474, and a very able and pleasantly written series of articles, by Mackie, in the Geologist for 1860. The lowest of the Folkestone series is composed of coarse grains of "quartz, glauconite, jasper, lydian stone," and phosphatic nodules. Beds of greensand then succeed, and in the highest portion near Copt Point, very hard silicious limestone and finally dark pyritous greensand with phosphatic nodules. Some of the ammonites (ammonites interuptus) in this zone are encrusted with beautiful crystals of selenite. Through the long ages that these accumulations of strata represent, the same physical conditions of this part of the world seem to have prevailed, for the great river still continued flowing as evidenced by the fossil wood so abundant in the upper part of this formation, and perhaps the old land that supported such vegetation was at least entirely submerged, and ceased to exist as a land surface, for the succeeding cretaceous rocks are through a thousand feet in thickness uncontaminated by anything that is not purely marine

Having left the Hastings Sands to the south, crossed the valley of the Weald Clay, and surmounted the Lower Greensand range, we find ourselves in the, so far as scenic effects are concerned, uninteresting valley of the Gault Clay. At Eastwear Bay, within a mile from the Folkestone junction railway station, the upper portion of the Lower Greensand, known as the Folkestone beds, is exposed to view, capped at Copt Point by the Lower and Upper Gault, where the constant attacks of the sea are continually laying bare fresh surfaces to atmospheric action. To the south of Martello tower number three, which forms an excellent landmark, we have the several beds in their natural order, nearer to the chalk escarpment the landslips going on from time to time have rendered all so confused, that it is impossible to study the beds in their proper succession, but it is, nevertheless, a rich hunting ground for the fossil collector. The best weapon for attacking the tough blocks of clay, that weather out from the great masses of the beds, I have found to be the ordinary bricklayer's hammer, which may be purchased for three and sixpence, weighing with its handle less than three pounds. A case for holding such a hammer may be formed by

cutting a rather stiff piece of leather into an oval shape, making a hole in it for the handle of the hammer to pass through, the larger side is then folded over the iron portion, and fastened with a stud or button. Two holes cut in the back, or leather loops sewn on, will enable the fossil hunter to suspend it over the shoulder or from the waist by a strap. A smaller hammer with a large knife or flat trowel carried in a similar manner are also well adapted for the work, and may be worn underneath the coat. Mackie, who wrote a very charming account of this part of the coast, published in The Geologist for 1860, recommends a fishing basket for the specimens obtained. A bag is certainly ill-adapted for the very fragile fossils of the Gault Clay. I have made use of a wooden box carried in a brown bag, which not only protects the delicate specimens, but the geologist too, by serving as a seat when nothing more inviting presents itself than damp stones or blocks of clay. A glass bottle and other commissariat arrangements I leave to individual taste. Good fossils can seldom be obtained from the dry hard clay, they must be sought for in those parts where the clay is still moist. The lower and darker beds exhibit the forms of Ammonites, Inocerami, Rostellariæ, &c., in striking contrast, their colour frequently assuming the appearance of copper when freshly deposited by a galvanic current. The surrounding clay has to be very carefully removed with a knife, the specimens then folded in paper, the better and rarer ones even packed in cotton wool, and allowed to dry slowly, lest the clay in drying should crack and fall to pieces. Some of the fossils are, however, not so fragile; their organic matter having been replaced by pyrites, they are exceedingly hard and durable, large quantities of the latter kind may be found on the beach, principally in the beds of the small streams of spring water that run across the sandy shore of the landslip. Most of these are the casts of the interior of ammonites, with the mother-of-pearl lining of the shells still adhering to them, and consequently appearing on the outsides of the casts, causing them to shine in the clear running water of the springs, with the most beautifully iridescent lustre, like opals in a setting of gold coloured bronze. I have observed few people pick them up without some expression of admiratiom and delight. Their form is not less beautiful than the brilliancy of their colouring. The contained animal as it grew added fresh chambers to its shell, forsaking the older ones near the centre of the volute, but afterwards holding communication with them by means of a tube called a siphuncle, so by that controlling the quantity of air contained within them, it was enabled to rise to the surface or sink to the bottom like the nautilus of the present day. These chambers with their partitions were formed like the groined roof of a cathedral, exhibiting a combination of symmetry with strength, that points to the great architectural triumphs of mankind, being the effect of the human mind working on matter, to bring about similar results to the Divine

mind of the Great Creator, of which it is the image. If man were to withhold his tribute of praise, to speak figuratively, "These very stones would cry out to his shame." The ammonites were an extensive genus, including the straight and stick like Baculites; twisted hook like Hamites; Scaphites, from the fancied resemblance to an ancient boat with recurved prow and stern; and tower-like Turrilites We are indebted to Mr. Price for a most ably scientific paper on this formation, published in the proceedings of the G. S. vol. 30—1874—p. 340., who divides the Gault at Copt Point into eleven zones. Number one the lowest, or junction bed with the Lower Greensand, commences with a band of iron pyrites, then comes a dark greensand seam with two lines of phosphatic nodules. The fossils of this zone are broken and rolled, and many of them glitter with spicules of selenite. Number two zone, which may really be considered the bottom bed of the Gault, is remarkable for its dark colour, and by contrast the metallic brilliancy of its fossils. Mr. Price says that this is the only bed in which selenite occurs in large pieces. Number three zone, which commences about fifteen feet from the Folkestone beds, is sometimes called the "light or Crab bed" from being a buff colour and containing the remains of crustaceans. Mr. Hudlestone gives an analysis of the clay iron-stone nodules which occur in it, as thirty per cent. of metallic iron. The next or fourth zone contains few fossils, but some nodules rich in phosphate of lime amounting in some specimens to fifty-five per cent. of tricalcic phosphate. The fifth zone is called the "coral bed." It is of a dark colour only, about eighteen inches thick, and is distinguished by some peculiar light coloured markings. Passing over the sixth and seventh zones, which are not remarkable so far as their mineral character is concerned, we arrive at the upper zone of the Lower Gault or number eight, at about thirty feet from the base of the formation, known as the "nodule bed," which is not more than ten inches in thickness. Number nine is taken as the base bed of the Upper Gault at about forty-five feet, the clay here changes to a very light colour, and is well distinguished by the shells and casts of the Inoceramus sulcatus which are generally found in a flattened out condition from the pressure of the superincumbent beds. Mr. Price designates this as the zone of the Ammonites varicosus which, together with the Inoceramus sulcatus, will enable the geologist to take his bearings, as the sailors say, and determine his position when working at this very frequently breezy headland. The last mentioned fossil is so peculiar that when once seen its form is not likely to be forgotten. In the tenth zone the gault becomes of a very light colour, partaking more of the nature of a marl than of a clay, as it contains over twenty-six

per cent. of carbonate of lime with about two per cent. of iron. The eleventh and last at seventy-two feet from the Lower Greensand is very similar to number ten, containing a large proportion of lime with very little phosphoric acid. The valuable and well arranged museum at Folkestone, where the objects of local intesest form a separate collection, should not be neglected and indeed should be visited before going to Copt Point that the eye may become familiarised with the fossils indicative of the several beds. Griffiths, the well-known fossil collector, has a cottage on the right hand side of the road leading to the Warren, where the geologist may not only obtain some very fine specimens, but also make himself acquainted with the fossil forms that constitute the guide marks of his investigations. The spherical nodules scattered through the various beds of the gault, called turtles' eggs, may possibly have been so, but their origin has not yet been determined. Mackie, whom I have previously quoted, supposed them to be the remains of belemnites. Mr. Seeley has remarked that these nodules have the appearance of being rolled, and that their spherical exterior has not been caused by the surface conforming to the figure of the organisms which they enclose. Mr. Charlesworth, at the same meeting of the Geological Society, cited in conformation of these views, the globular masses at the base of the shark's teeth, found in the Crag, which do not in the least conform, the shape of the fossil they enclose. Phillips, page 356, mentions that in some places the Gault furnishes an excellent brick-earth from which light coloured bricks may be made. As night gives place to day, or one season to another, the conditions under which life became individualised changed, and so the creatures of this geological period gave place to others or adapted themselves to the altered conditions that mark the next formation, which as it is composed of the casts, shells, and remains of what once were living things, may not unaptly be called the great white cemetery of the chalk.

At Folkestone the Gault Clay under Martello Tower No. 2, is capped with the Upper Greensand, which is about fifteen feet thick in this place. It shows again at two or three places along the beach in East Wear Bay, where it has been brought down to the level of the sea by the movements going on in the underlying clay beds, caused by the action of the water and the pressure of the higher part of the cliffs. Its proper geological position is at the base of the chalk, it is however represented here but to a small extent, thinning out to the westward to three or four feet at Cæsar's Camp, after which there is no re-appearance of it until we reach Aylesford, where it is only eighteen inches thick. When iron was so largely smelted in the Weald this formation supplied the firestone that was used for lining the furnaces. Large quantities of hearth stones are now obtained at Godstone from underground workings, which are said

to extend three miles. It derives its name from the green grains of Glauconite, which is chemically a hydrated protosilicate of iron and potash. These sands have not been produced by mechanical action alone, for under the microscope many of the grains have been shown to be casts of foraminiferæ in glauconite, so instead of being a mechanical deposit in a shallow sea, as so many sands and sandstones are, it may be a very deep sea formation. It is mentioned by Dr. Carpenter that in deep sea soundings chalk is found to be deposited to a depth of twelve thousand feet, but below this depth the calcareous shells of the foraminiferæ are re-dissolved, and silicious casts of their interiors are found, the original matter having been replaced by silica. This is very remarkable, as we percieve at the present time the same operations of nature at work in the deep sea that went on ages ago, when the Upper Greensand was forming at the bottom of the cretaceous ocean. (See proceedings of G. S., for 1877, page 434.) Dr. Dawson states that this glauconite is similar to the mineral that is found filling some of the fossils in the Silurian beds, and also to the serpentine in the minute chambers of the Eozoon in the Laurentian rocks. According to the same authority such materials are only found in the deeper parts of the ocean, where the water is comparatively warm, as in the Gulf Stream, so that from the earliest to the present time the impress of the same creative hand is evident in nature. Some of the blocks of this greensand, which eastward of Martello Tower No. 2, strew the beach, do not appear green on the surface, but on drawing the point of a hammer across them a distinct green streak is observable. Many of these masses are full of cubical pyrites, which glitter on the dark green back ground of the damp mineral, like gold. Travelling in a northerly direction along the coast, blocks of chalk are next encountered that have rolled down from the grand cliffs, which form a wall, without a break, four hundred feet in height and five miles in length, stretching from Folkestone to Shakespeare's cliff. Here the botanist will find as delightful a hunting ground as the geologist. My love of the beautiful must be my apology for mentioning that except over the peaks of snowy mountains I have never seen the sky look so wonderfully and beauti fully blue as it does at times when seen over the edges of these white cliffs. In the month of February I have left ice on the roadsides and the keen winter's air; at the top of the cliffs, and on descending to the sea level have found a summer's climate. On a hot summer's morning, when there is scarce a breath of air, the sun's rays falling on these cliffs cause an induced current of cool refreshing air from the sea. Chalk has the great advantage when dry of not being slippery, as it never polishes with the frequent treading of feet like mountain limestone and some other rocks; but there is a reverse to this picture, for when a south-west gale sets in, accompanied as anything generally is from that quarter by moisture, the steep paths up

the cliffs are something like greased planks under the feet of the unfortunate geologist, who may think of making his retreat by this line of route to Dover. The chalk may be considered to form the larger portion of Kent, for the tertiary beds, as before stated in the section of the physical geography of the county, only occupy hollows or depressions on the surface of the chalk. In a paper published with the Annual Report for 1878, page 33, I drew attention to the organic origin of chalk, for there is reason to suppose that the whole of the chalk comprising the North and South Downs, and extending from the south of Dorchester to Flamborough Head, Yorkshire, and of more than seven hundred feet in average thickness has passed through the bodies of living creatures. Some chalk contains ninety-eight per cent. of carbonate of lime, the remainder being alumina and silica, with small quantities of oxide of iron. In the lower chalk, which is about four hundred feet in thickness, there are no, or few, flints, but in the upper chalk, about three hundred feet in thickness, the bands of nodular flint occur, so familiar to everyone acquainted with this district, forming the long lines of black nodules which, by their contrast with the white rock that they are imbedded in, constitute a very striking feature in some of the sea cliffs, notably so at the Needles on the coast of the Isle of Wight, where these lines are almost vertical, the chalk having been turned on end long after its deposition in the depths of the cretaceous sea. In the Dover cliffs the dip to the north-east is so small that they appear horizontal. Many conjectures have been made as to the origin of flint. One scarcely deserving notice was that they were of meteoric origin, and so fell from the sky in a state of igneous fusion, and settled down into the sea when the chalk was forming at the bottom. This, so soon as the nature of flint was enquired into, became untenable, as they were found to contain delicately organised structures and fossils, that evidently had not been exposed to the extreme temperature required to vitrify silica. Dr. Bowerbank, whose researches in sponges rendered their structure so familiar to him, came to the unhesitating conclusion that the flint nodules were once sponges growing at the bottom of the sea, and that the gelatinous matter known as sarcode, which covered their network skeletons, became replaced by silica, so that we may regard these bodies as petrified sponges. The resemblance of them to an ordinary bath sponge is sometimes quite striking, the large holes frequently passing through them, and the mass occasionally holding in its embrace a shell, are precisely that which is observable in either case. Thin sections of flint also show the spongy structure, and added to this, the peculiar spicules of sponges are frequently found in flint. That such structure is discernable in the chalk does not militate against this theory, it only shows that there were many sponges that did not become

solicified. With a theory so complete and beautiful, it, however, still remains to be explained how this sponge-like structure can be accounted for in the interior of a fossil, as in the case of a shark's tooth, brought to the notice of the Geological Society by Mr. Charlesworth. For further information on this interesting subject, I beg to direct your attention to Mr. G. Dowker's lecture, delivered before our Society, and published with our annual report for 1877, page 20, which embraces in an able and succinct manner most that is at present known of the subject. Colonel Cox, of Fordwich, by polishing sections of pebbles obtained principally from the Lower Chalk has made a splendid collection of fossil sponges, ventriculites, choanites, &c., the structure of which by this means becomes beautifully apparent. Nodules of pyrites occur, especially in the grey chalk, which also seem to be organised remains transformed into the bisulphide of iron, their shining golden appearance frequently causing them to be used in the houses of the neighbourhood as chimney ornaments, from whence they may find their way into the fire, and surprise the uninitiated by burning with the blue flame and odour of sulphur, red oxide of iron remaining behind. Some of the best known fossils of the chalk are the echini, notably the Anachytes ovatus, Galerites albogalerus, and Micraster coranguinum, the two former popularly known as fairies' loaves, the latter as serpents' hearts. One of the most beautiful of the bivalve shells, the Lima spinosa, is also frequent, but very rarely is it found with the elegant spines attached, to which it owes its name. All these shells occur sometimes with the interior filled with chalk, at other times with flint. The spines of the Lima occasionally may be found running through a flint, and in this manner preserved in one of the most imperishable of substances. In the chalk pit near the clump of fir trees just beyond the Chartham Lunatic Asylum may be found fragments of the shell of a Pinna, which also occurs in the Ramsgate cliffs, under which it may be picked up as the waves wash it out of the chalk. It is locally called "beef and bacon," from one side being of a brownish tinge and the other white. This shell forms a good microscopical object. It is mentioned in Gosse's Evening with the Microscope, page 50, and Dr. Carpenter on the Microscope, page 590. In cutting the railway tunnel through Lydden hill, a block of coal was found which weighed about four hundred weight. "It was embedded in the chalk where the latter was free from faults. It was highly bituminous and burnt readily, resembling some of the oolitic coals, but was unlike the true coal of the coal measures." Mr. Goodwin Austin believes it to have been a block of lignite carried into the cretaceous sea by floating ice, in the same manner as it may be supposed was the granite boulder, found in the chalk near Croydon. In a paper by Mr. G. Dowker, published in the Geological Magazine for 1870, page 466, the author has done us the good service to give

the beds local names, thus, in ascending order, the grey chalk and chalk without flints, sometimes called the lower chalk, he names the Folkestone chalk. The chalk with but few flints and large ammonites, the Dover chalk. A grey bed of chalk with organic remains, the St. Margaret's chalk. The chalk containing numerous bands of flints, constituting the Ramsgate cliffs, the Ramsgate chalk. The higher bed containing, like the lower chalk, but few or no flints, Mr. Dowker calls the Margate chalk. The natural joints of this rock are very conspicuous in the Margate cliffs, running like those I have noticed in the oolite in a south-easterly and south-westerly direction, and which the waves have enlarged into the caverns that lend a certain picturesqueness to this part of the coast, that lacks the height and rich-colouring of the nobler cliffs of Folkestone.

As in a cathedral, the Norman and Early English styles preceded the Perpendicular, so the primary and secondary were succeeded by the tertiary forms of life. The chalk closes the reptilian or secondary age. New forms of animal life make their appearance in the period that follows, which, for the sake of convenience, has been divided into the lower, middle, and upper tertiary, sometimes spoken of as the Eocene, Miocene, and Pliocene. The lowest member of the Eocene, locally known as the Thanet sands, in some places penetrates into the chalk where the latter has by chemical action been dissolved away through water percolating from above, and so forming the sand pipes and irregular hollows, showing so conspicuously in section at the sides of railway cuttings through the chalk. At the base of these Thanet sands is a stratum of tabular and green-coated flints, the green colour of the latter being due to protosilicate of iron, which also communicates the same tinge to several of the beds, thus forming tertiary greensands. Mr. Whitaker, the great authority on the lower tertiaries, in a paper published with the proceedings of the Geological Society for 1886, suggests that this bed may even have been formed after the upper ones were deposited by the dissolving away of the chalk, as the contained flints are not water-worn. It is seldom five feet thick. In agreement with an opinion expressed by Mr. Dowker in his lecture on flints, quoted in my last paper, the former authority mentioned a green-coated flint having been found partly enclosed in a brown tabular flint, showing that the latter must have been formed subsequently. A succession of loamy beds then occur, followed by sands containing green grains. As these green sands weather on exposed surfaces to a reddish brown, they are apt to escape observation. When the oxidised surface is removed, the original colour becomes apparent. The upper beds at Reculver are fine grained sands hardened into sandstone, often stained with markings of oxide of iron. Mr. Dowker, in a paper published in The Geologist for 1861, page 110 and 213, gives a section of the

tertiary beds cut through by the London, Chatham, and Dover Railway at the New Road, Canterbury, and also describes a boring made by him at Stourmouth extending to a depth of 163 feet including 20 feet of the underlying chalk. The fossils of the Thanet sands, Mr. Whitaker states, are those indicative of a temperate climate. They are principally bivalve shells such as the Cyprina, Cytherea, Pholadomya, &c. At Pegwell Bay the lower portion of these sands are exposed to view, and at Reculvers the upper. At both places beds of sandstone occur. It has been remarked by the same geologist that where the chalk has a thick covering of these beds the sand-pipes are not so frequent as where it is but slight. Several sand pits have been opened in this and the next formation known as the Woolwich beds from which it is sometimes difficult to distinguish it. The Thanet sands are however generally finer grained and more evenly bedded than the Woolwich. Pits occur at St. Stephen's, Fordwich, and Boughton. The Woolwich beds though sandy in this district, in others to the west, consist of mottled clays, which caused it to be called the Plastic clay formation by the older geologists. The fossils are partly fresh-water and partly marine; the latter predominating towards the east, shows that the direction of the river that deposited the fresh-water shells must have been from west to east or in the same direction as the Thames. (See Lyell's Elements, page 294.) It is supposed by Prestwich that this river drained the Wealden area like the Medway, and so might have flowed in the direction indicated by the fossils, through the lower and seaward portion of its channel. Beds of lignite and shingle also occur, but the most striking accumulation of the latter is on the succeeding Old Haven beds. These are rounded flint pebbles remarkably of the same size and colour, their longer diameter being about an inch, and are evidently the result of the waves of a stormy sea, which must have rolled and re-rolled the large flints of the chalk until they were reduced by these spherical pebbles and must have separated out, the large from the small, on an evenly sloping beach, in a manner similar to that in which shot is sorted in its manufacture by being allowed to run down an inclined plane. The pebbles in some districts are replaced by ironstone notably between Selling and Boughton which is also fossiliferous. There are masses of this ironstone at the Canterbury entrance to the Whitstable railway tunnel, and a curious ferruginous conglomerate mentioned in a previous paper. An attempt was made some years ago to work this ironstone, some small mines having been at that time opened near the "Sugar-loaf" hill on the road leading from Selling to Boughton, the object being to provide ships with a remunerative return freight instead of going back in ballast. The yield of iron was however not great, only amounting in some specimens I analysed to 28 per

cent. This, together with difficulties respecting right of way and cost of transport to Faversham or Whitstable, caused it to be abandoned. At Shottenden Hill the pebbles with fine sand attain a thickness of thirty feet. The commencement of the Old Haven beds in many places may be distinctly made out by a peculiar purple coloured band. This may be very distinctly seen in the road cutting near the Vicarage, Hernhill. A walk of about ten miles from Shottenden (readily reached from the Selling station), under the hill side covered by the woods of the Old Blean Forest, past Boughton and Hernhill to Whitstable, will prove a pleasantly instructive walk to the geologist, and a delightful one to the lover of the picturesque. Perhaps there is no season of the year when it can be seen to a greater advantage than in October, when the autumnal tints have given colouring to the richly wooded hills, which the geologist on ascending will find to command lovely glimpses of the distant sea. The conical hill known as the Sugar Loaf and two or three similar ones will be found to be capped by the Old Haven beds. These by resisting denudation have preserved the softer ones below them, while the uncovered beds form valleys of excavation. From such points of view the loftier range of hills on which stands Dunkirk church and the Forest of the Blean, will naturally lead the thoughts of the geologist to the London Clay of which their mass is formed, together with the Isle of Sheppey, where it has a thickness of four hundred and fifty feet. This is a much more homogeneous deposit than the Thanet sands, or Woolwich beds. Probably deposited in a deeper sea the stratification would be less disturbed by currents and the action of the waves, the latter having seldom much effect at a greater depth than forty feet. The proximity of some great river is still apparent, draining a continent whose climate must have been tropical, judging from the fossils allied to palm nuts, custard apples, gourds, acacia fruits, &c. Dr. Hooker mentions palm nuts floating in such quantities on some of the branches of the Ganges, as to greatly obstruct the paddlewheels of steamers. When we remember the great luxuriance of the vegetation within the tropic, we have an additional reason for concluding the abundant vegetable remains of the London Clay to be due to an elevated temperature. The animal remains consisting of several species of crocodiles, turtles and thick skinned animals allied to the tapir, and also a sea snake, thirteen feet long, lead us to the same conclusion. Lyell remarks that as the turtles and crocodiles must have resorted to the land to lay their eggs, these animal remains could not have been deposited at a great distance from the shore. The molluscs, Voluta, Conus, Cyprea, &c., also bear testimony to the high temperature that then prevailed. Large quantities of wood, belonging to a tree said to be allied

to the olive, are now picked up under the cliffs between Whit stable and Old Haven Gap, in which the vegetable matter has been transformed into pyrits. It is commercially used for making protosulphate of iron and oil of vitriol. On the coast of Sheppey I have picked up large pieces of fossil wood bored through by the Teredina personata, the Eocene representative of the present Teredo or ship-worm. The wood has been changed into a silicate of lime and alumina. The bore holes made by the mollusc are lined with a calcareous cement, a means which the creature adopted for making his habitation comfortable, similar to that which we have made use of in the plaster that covers the walls and ceilings of our rooms. Not that man is merely a copyist, but because the one Creator has given reason to man and the power of adaptation to lower beings, so that a similar requirement is attained by like means, in the same manner that the touch of a great artist is observable through many and various works and his style transmitted to his pupils though their productions may be inferior. The nodular masses of silicate of lime and alumina so abundant in this formation, remind one of the flints in the chalk. From the peculiar reticulated planes of calc spar that pass through them, they have received the name of Septarieœ. In one of these nodules I obtained from the Isle of Sheppey, I found some very curious foliated crystals of sulphate of baytes, and in another from the Bognor beds which I was so fortunate as to break open, was disclosed the shell of a Pectunculus brevirostrum containing four small oysters. (See annual report for 1877, page 44.) The large mollusc must have arrived at maturity and died; the gaping shells were then taken possession of by four lively young oysters, who there settled down for life and that but a brief one, for they were like the young princes in the Tower, smothered in their bed, and for countless ages have been enclosed in a beautiful little coffin. The London Clay of the Isle of Sheppey is covered in some places by the Bagshot sands, thus enabling the geologist to determine the thickness of the clay, without which it would be impossible to make out how much had been removed by denudation. It is estimated at four hundred and fifty feet. Leaving out the Old Haven beds which vary from a few inches to thirty feet, and taking the Woolwich beds at fifty feet, and the Thanet Sands at a hundred, we have a thickness amounting to six hundred feet of tertiary beds. The age of the great reptiles which we glanced at in the Wealden draws to a close in the cretaceous period and the reptile is no longer the leading feature of the animal creation when we pass from the secondary to the tertiary rocks. A few and scattered remains in the London Clay of the Isle of Sheppey of three specimens of Pachydermata (mentioned in Lyell's Elements,

page 290) are the earliest representatives in this district of the new order of things. In the Lower Oolite some very small marsupial animals seem to have been called into existence, which like the coming events that cast their shadows before them, form the advance guard of the gigantic animals that culminated in the Middle Tertiary period. It is difficult to understand how the first small and feeble creatures could have defended themselves against the huge and numerous reptiles that were their contemporaries, had it not been specially so designed by the Creator. There is in it this moral significance that warm-blooded creatures possessing affections for their young, akin to those which in the human race take a higher form of love, were specially protected, thus constituting a hopeful type in nature of the future and final triumph of gentle natures. Whilst we contemplate these things we perceive in the process of geological fulfilment, the promise, "Blessed are the meek, for they shall inherit the earth." Any paper, whatever its merits, on the Tertiaries of Kent, would fail in illustration without a reference to the well-arranged and admirable collection of local fossils, in the private museum of G. Dowker, Esq., F.G.S., of Stourmouth.

After the Bagshot Sands which partly cover the London Clay of the Isle of Sheppey, there is no other geological record in the district, except the gravels and brick-earths capping some of the hills and lining the lower portions of the valleys, and some obscure beds occurring in patches along the ridge of the chalk escarpment and occupying an elevation of from four to six hundred feet above the sea. A silicious ironstone belonging to these beds, containing about 24 per cent. of iron, is found along the North Downs, notably above Folkestone, at Paddlesworth, Postling, Hastingleigh, at Wye Downs, and Penny Pot. In a sand-pipe, near Lenham, a few fossils have been found, but their imperfect condition has not enabled geologists to determine to which tertiary period they belong. Mr. Whitaker regards them as overlapping Woolwich or Old Haven beds. (Proceedings of Geological Society, 1866, page 401.) Prestwich thinks they may belong to the Crag. Lyell on the other hand believes them to be Miocene. (Lyell's Elements, 233.) Mr. James Reid drew attention to this formation and exhibited some fossils obtained from Lenham, in March, 1877. The fossils were similar to those of the Red Crag. Mention was also made by the same gentleman of remains of ancient iron-works and slag heaps, the slag containing a larger per centage than the ore itself. It is to be regretted that no record has been kept of these interesting remarks. With the exception of these ironstone beds a great gap occurs between the Lower Eocene and Pleistocene, to use a simile, as if several volumes had been removed from an extensive work such as an enclyclopedia, the earlier

volumes, as it were, are in the library, but several towards the end of the series have been removed; in other places they are continuous, but here those geological volumes are absent that could tell us of the strange things that went on where we now reside, through a period that cannot be estimated by years. From the Miocene period to the present a greater lapse of time has occurred than that which is represented by the whole of the secondary and part of the tertiary strata, from the Trias to the Miocene. (Professor Haughton, British Association, 1878.) A time sufficient to allow of animal species changing from the thick-skinned hog-like type to those more nearly allied to the denizens of our own tropical jungles, and from their remains, found in other countries, exceeding in size and number, and more remarkable still the variety of their species, the mammalia of the present day. This indeed seems the day of the four-footed things. The vegetable kingdom also rivalled in luxuriance the animal, for the now frozen regions of the arctic lands were then clothed with plants and evergreen shrubs, telling that a warm climate probably prevailed throughout the world, for astronomers do not admit the possibility of the earth's axis having changed. The Nummultic limestone which had been accumulating through the middle Eocene period reached before its close more than a thousand feet in thickness. When we consider that this like the chalk was the work of forminiferæ, it too, is additional evidence of how vast the period, which is represented in Kent by a blank, must have been. Lyell states that six hundred species of shell have been found in the limestone of the Paris basin. Dr. Dawson says the ichthyosaurus and gigantic lizard fish of the secondary period were replaced by the true whale, "thus marking the advent even in the sea of the age of mammals as distinguished from the age of reptiles." We know not how long great physical changes may have been at work or what time mountain ranges, such as the Alps, the Pyrenees, Carpathians, and Himalayas, may have taken to rise from the bottom of the sea, it may have been through ages of gradual and imperceptible elevation, having its counterpart in the gradual sinking of the floor of the southern ocean, registered by the growth of coral forming the Atols, and Barrier reefs; or to draw an analogy from our own states of activity and rest, the earth too may have had its periods of short and intense action, and long ones of comparative repose.

The Nummulitic limestone, the work of small, but countless creatures of the sea, was by an elevation of part of the ocean's bottom, towards the close of the Eocene period, carried up to a height of 10,000 feet in the Swiss Alps, and in Thibet 16,000 feet. This same limestone was largely used in building the Pyramids; it occurs at Bagdad, at the mouths of the Indus,

Cutch, and in the passes leading to Cabul. (Lyell's Elements, page 305.) This great thickness and extent of rock, the elevation of the greatest mountain ranges from the ocean's depths, the change and development of whole species of animals and plants, both of sea and land, are only some of the events that happened between the deposition of the London Clay of the Sheppey and Whitstable cliffs, and the gravels and brick-earths that furnish the road making and building materials of the district. It is necessary to impress upon the mind this immense period of time, in order that we may the better understand how the denudation of the Weald was brought about.

The great disturbance of the strata at the close of the cretaceous period, that resulted in the upheaval of such vast mountain ranges, is supposed to have been brought about by contractions going on in the earth's crust. As the skin of an apple shrivels up, or wrinkles gather on our own faces, as we with our mother earth grow older, so a wrinkle passed across this portion of the world, in a north-westerly direction, in a line from Hastings to near Farnborough, constitutes the anticlinal axis of the Weald. This seems to have been a gradual upheaval, for the sea planed the strata off as they were brought near its surface and consequently within range of the action of its waves, rolling the flints off the chalk, and the chert of the Lower Greensand until nothing of them was left but their very hard hearts, the Eocene pebbles of the Woolwich and Old Haven beds. This upheaval and depression was probably repeated several times, for a depression seems again to have followed, when the London Clay was deposited in deep and quiet water. We must still bear in mind the length of time occupied by these changes. The debris of the cretaceous and Wealden rocks, as attested by the flint pebbles, contributed materials for filling the depression in the chalk to the north and south, known as the London and Hampshire basins. The Wealden district having in this manner been denuded of thirteen hundred feet of cretaceous and Wealden rocks was reduced to an elevated plain, having its watershed to the north-east and south-west of the anticlinal ridge. The water running down these slopes like the roof of a house cut out the river channels at right angles to the strike of the rocks, and consequently in the same direction as their dip, which is to the north-east on the one side of the anticlinal and to the south-west on the other. We have five rivers to the north, the Stour, Medway, Darent, Mole, Wey, and four corresponding ones on the south, the Arun, Adur, Ouse, Cuckmere, and probably once a fifth corresponding to the Stour, the seaward portion of which through encroachments of the sea has ceased to exist. The relative and opposite positions of these rivers is most remarkable, they do not flow out

of the eastern ends of the valleys of the Gault and Weald clays, but at right angles to what is now the highest ground, they charge at the highest parts of the escarpment of the North and South Downs and have breached them through from their summits to their base. It is a natural deduction from these premises that when the rivers began to flow, the whole of the Weald of Sussex and Kent was an elevated plain. It seems to me that in addition to the north-westerly direction of the great valleys, a set of flexures took place at right angles, with fissured crests, that gave the rivers their initial course, for if this was not the case I do not know how we can account for the opposite position of the rivers on each side of the anticlinal, and their gorges occurring not in the lowest but sometimes in the highest crests of the hills. In a former paper on the physical geography of the district I pointed out how unsatisfactory the marine theory of denudation was as applied to the Weald, as there is no direct or indirect evidence of the presence or action of the sea. On the other hand we see patches of gravel, and ironstone beds capping the tops of hills in this neighbourhood, and occupying the most elevated positions, where they have protected the softer beds below them from being washed away by the rain; and where they do not occur we find deep valleys of excavation. When standing under the lofty escarpments of the chalk or greensand, we do not realise how insignificant is the vertical height of the hills when compared with the horizontal scale, but if we view a correct model of the country, this becomes very apparent and we may perceive that the frosts, the rain, and running water have been nature's chief tool in sculpturing the scenery of the Weald. We have seen that this northern portion of the world during the middle Tertiary period enjoyed a warm climate, and the glaciated surfaces, boulder clay, and drift of the rest of Britain tell us a geological summer time of long ages was succeeded by a winter of perhaps equal duration. It is taken as evidence that this part of England, to the south of the Thames and Severn, was not during this ice period beneath the sea, because none of these glacial deposits are found within it. The snows of countless winters falling upon its exposed surfaces must have congealed into an ice cap, the ice of which obeying similar laws to those which govern the movements of running water, would flow to the north and south of the anticlinal axis, carrying before it all the loose flints, pebbles, and debris of the rock, spreading the flints of the chalk in sheets over the London clay, the Woolwich beds, and Thanet-sands. When as Dr. Dawson calls it "the spring time of the world" returned, the meeting of the snows would cause most of the sand and lighter particles to be washed away, leaving the sheets and irregular patches of gravel that once perhaps filled hollows in the surface or the bays of old coast lines. Some writers have called this the

pluvial period, when rains heavier than even those which now fall in the Bay of Bengal poured torrents over the land arranging and re-arranging the gravel beds, which as the streams cut their way to lower levels, formed protecting caps to the underlying and softer beds, and in this manner may be accounted for the presence of the beds of gravel at elevations of four hundred feet, as in the wood above the Selling tunnel; three hundred near The Gate public-house, on the Boughton road; two hundred and twenty seven feet at Rough Common; two hundred and twenty at the Whitstable railway tunnel; two hundred in the Park above Hales Place; one hundred and fifty at Broad Oak; one hundred and thirty five at Westbere; and ninety feet at the Halfway House on the Ramsgate road.

On the south east side of the valley there are also elevated gravel beds as at the Old Park, one hundred and fifty feet; Scotland Hills, one hundred feet. Also irregular patches of gravel, as in Bigberry wood near the Chartham Hatch schools, two hundred and fifty five feet; in the same wood above Tunford, two hundred and forty nine feet; Theread wood, half a mile east of Hernhill, three hundred feet; Clapham hill, Whitstable road, two hundred and twenty feet; Thornden wood, three hundred feet; and Broomfield, one hundred and seventeen feet. But as the rivers of the district cut their way to lower channels, beds of the same gravel were left in patches and terraces at much lower but varying heights, in some instances at two hundred feet below the higher beds The lower level gravels conforming to the course of the river, are at Kennington and Willesborough, two hundred feet; Godmersham, one hundred feet; Chilham, one hundred and seventy five feet; Chartham, about seventy feet; and Wincheap, fifty feet above the sea level. These gravels are the same mixture of Eocene pebbles and subangular flints from the chalk as those of the higher elevations, being in fact the same washed down to lower levels by the river undermining its banks. Owing to some change in the relative heights of sea and land, tidal water at one time flowed higher up these valleys, perhaps to the height of sixty feet at Canterbury, allowing the brick earths to be deposited. The action of tidal rivers dealing with brick earths and gravels may be witnessed at the present time in the river Avon at Clifton, where at high water the stream becomes very sluggish, permitting fine alluvial matter to be deposited, whilst at low water the rapid stream tears along stones many pounds in weight. I have seen the tops of isolated piles covered with mud six or eight inches thick. The accumulated mud was last year threatening the framing of one of the landing stages with destruction. The brickearths of the Thames valley contain many fresh water and land shells. (Proceedings of Geological Society, 1869, page 99.) Among the gravels are casts in flint, generally much water worn, of chalk

fossils, but sometimes the fine markings of the shells of echini are beautifully preserved. More interesting still, below and mingling with these lower gravels and in a silt below them are elephants' tusks and teeth. Specimens of the latter, many pounds in weight, and the former truly gigantic in their original state, but now only a few feet in length, may be seen in the Canterbury Museum, and in the still finer collection at Maidstone. In these river valleys have also been found remains of the rhinoceros, lion, deer, bison, and other inhabitants of the preglacial, postglacial, and perhaps interglacial periods. (P.G.S., 1869, page 197.) Still more interesting than even these is the first evidence of the presence of man, in the rude flint implements that answered the purpose of weapons, knives, and scrapers, with which our British forefathers flayed and scraped the skins by the river side of the animals that with flint weapons they had slain. Numbers of the flint flakes are found in the gravel pits near St. Mildred's Rectory, which an experienced eye will detect at once, from those broken by the accidental blows of picks or natural causes, such as the frost. The bump of percussion is as indicative of a sudden blow as the chipped edges are of design. (See annual report for 1879, page 35.) That the aspect of the hills and valleys is not due to any sudden convulsion of nature, but principally to those operations that we see going on so silently, but constantly around us, is well expressed in a quotation from Tennyson with which Ramsay commences his excellent little book called "The Physical Geography of Great Britain."

> "There rolls the deep where grew the tree,
> O earth, what changes hast thou seen?
> There where the long street roars, hath been
> The stillness of the central sea.
> The hills are shadows, and they flow
> From form to form, and nothing stands;
> They melt like mist, the solid lands
> Like clouds they shape themselves and go."

In drawing these papers to a close, no one is more sensible of their shortcomings than myself. I feel that like a lady's letter the most important part is the postcript, that is the index I have prepared to Geological Magazines and works in our own library, and which I trust may not be a fruitless labour in the cause of Geological science.

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N.B.—The Committee meet on the Saturday next following the date of the Scientific Meeting in each month.

ANNUAL MEETING,

TUESDAY, JANUARY 25, 1881, *at* 4 *o'clock p.m.*